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ABSTRACT

The changing nature of the business school computing environment is monitored in a report whose purpose is to provide deans and other policy-makers with information to use in making allocation decisions and program plans. This survey focuses on resource allocations of 249 accredited U.S. business schools and 15 Canadian schools. A total of 128 schools completed the 13-page questionnaire, yielding a 48% response rate. The report is divided into nine sections: (1) introduction; (2) profile of surveyed schools (demographics, budgets); (3) computer resources (mainframes, minicomputers, and computing staff and services); (4) microcomputers (models and market penetration, microcomputer densities, acquisition and ownership, and portable systems); (5) communications (terminal and microcomputer communications, and local and wide area networks); (6) software (word processing, spreadsheets, database management systems, integrated and statistical packages, mathematical modeling, simulation, games, languages and graphics); (7) instruction and research (curriculum penetration, courseware sources, classroom electronic equipment, training, computer course and language requirements, and available databases); (8) administrative activities; and (9) summary and issues. The evidence supports the general impression that microcomputers have become a significant component in a school's resources; whereas 20% of schools had microcomputers 5 years ago, today the figure is 100%. Operational costs and computers support staff are important funding allocation issues. Data are presented in 17 tables and 10 figures. Three appendices comprising nearly half the document provide data on the schools and their mainframe/minicomputer and microcomputer equipment. (KM)

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THE JOHN E. ANDERSON GRADUATE
SCHOOL OF MANAGEMENT AT UCLA

FOURTH ANNUAL UCLA SURVEY
OF
BUSINESS SCHOOL COMPUTER USAGE

September 1987

Jason L. Frand
Ephraim R. McLean
Julia A. Britt

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The authors wish to thank those individuals within the schools that responded to the survey for the time and care they took in the completion of the questionnaire. This report is a tribute to their effort. The authors also wish to acknowledge and thank the Education Industry Marketing Group of Digital Equipment Corporation for their support of this project.

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1 Introduction

The microcomputerization of business schools is well underway, with significant resources being invested in hardware, software, and personnel. At the same time, the mainframe/minicomputer systems supporting the growing number of computational and data requirements which exist within these schools, are not being ignored. The goal of this, the Fourth Annual UCLA Survey of Business School Computer Usage, is to monitor the changing nature of the business school computing environment. The purpose over the past four years has remained the same: to provide deans and other policy makers with information they can use in making allocation decisions and program plans with regards to computing. The reader is cautioned that this Survey reflects what the schools report they *are* doing, and is not an endorsement of what they *should* be doing.

The First and Second Surveys gathered information on the hardware, software, and resource allocations of schools while the Third Survey gathered information on issues central to the deans.[1] This year's Survey once again focused on resource allocations.

The population for the current Survey was the 249 schools currently accredited by the American Assembly of Collegiate Schools of Business (AACSB). Furthermore, 15 Canadian schools were invited to participate. In May 1987, a background letter, a postcard, a thirteen page survey questionnaire, and a copy of the Third Annual Survey report were sent to each dean. The dean was asked to identify a representative to complete the questionnaire and to return the postcard with the individual's name. One hundred thirty-eight postcards (52%) were returned and, of this number, 128 schools returned completed questionnaires. Overall, this was a 48% response rate.[2] Table 1 lists the schools that participated in this year's Survey.

For several key categories of data (budget expenditures, staff support, and student and faculty microcomputer densities), the data are divided into quartiles to give a more detailed picture of the distribution of activity across schools. There are 32 schools in each quartile if all of the schools supplied usable data for the variable in question. For each quartile, the median value for the variable is reported. The median was felt to be a more representative measure than the mean because it avoids the possible skewing problems that can occur with the mean when there are extremely high or low values in the data. In the various tables and figures, the sample size ("N" value) may vary considerably because of missing data. Also, throughout the report, where appropriate and available, comparable data from the 1984 and 1985 Surveys are included. Seventy-six (61%) of the schools participating in the 1985 Survey completed questionnaires for the 1987 Survey.

The report is divided into nine sections: Introduction, Profile of Surveyed Schools, Computer Resources, Microcomputers, Communications, Software, Instruction and Research, Administrative Activities, and a closing Summary. At the end are three Appendices with details on a school-by-school basis, including descriptions of the schools and their mainframe/minicomputer and microcomputer equipment.

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[1] For a summary of the Second Annual Survey, see the *Communications of the ACM*, January 1986, Volume 29, Number 1, pages 12-18. Copies of the previous Surveys can be obtained at $2.00 each by contacting the Information Systems Research Program, Anderson Graduate School of Management, University of California, Los Angeles, CA 90024-1481.

[2] The complete SAS files of the 1985 and 1987 raw data is available to interested researchers. For information on how to obtain the data tapes, please contact the authors at the Information Systems Research Program.

Table 1
Participating Schools

University of Akron
University of Alberta
University of Arizona
Arizona State University
University of Arkansas, Fayetteville
University of Arkansas, Little Rock
Aubrun University
Babson College
Boston College
Boston University
Bradley University
University of British Columbia
University of California, Berkeley
University of California, Irvine
University of California, Los Angeles (Anderson)
California State University, Fresno
California State University, Fullerton
California State University, Hayward
California State University, Long Beach
California State University, Los Angeles
Canisius College
Case Western Reserve University (Weatherhead)
University of Central Florida
University of Cincinnati
Cleveland State University (Nance)
University of Colorado, Denver
Columbia University
Cornell University (Johnson)
Creighton University
Dalhousie University
Dartmouth College (Tuck)
University of Dayton
University of Delaware
University of Denver
Drexel University
Duke University (Fuqua)
Duquesne University
East Texas State University
Eastern Washington University
Florida International University
Florida State University
Fort Lewis College
Georgia State University
Harvard University
University of Hawaii
Hofstra University
Howard University
University of Illinois, Chicago
Indiana University
Indiana University-Northwest
University of Iowa
University of Kansas
Kansas State University
University of Kentucky
University of Louisville
Loyola Marymount University
Loyola University, New Orleans
University of Maine, Orono
University of Maryland
Massachusetts Institute of Technology (Sloan)
McGill University
McMaster University
Miami University
University of Michigan
University of Michigan-Flint
Middle Tennessee State University
University of Minnesota (Carlson)
University of Missouri, Columbia
University of Montana
New York University
University of North Carolina, Charlotte
University of North Carolina, Greensboro
University of North Dakota
North Texas State University
Northern Arizona University
Northwestern University (Kellogg)
University of Notre Dame
Ohio State University
Oklahoma State University
University of Oregon
Oregon State University
University of the Pacific
Pacific Lutheran University
University of Pennsylvania (Wharton)
Pennsylvania State University
University of Pittsburg (Katz)
Portland State University
Queen's University, Kingston
Purdue University (Krannert)
Renssaelaer Polytechnic Institute
University of Richmond (Robins)
University of Rochester (Simon)
Rollins College (Crummer)
Rutgers-State University of New Jersey
Saint Cloud State University
St. John's University
University of San Fransisco (McLaren)
San Jose State University
University of South Carolina
University of Southern California
Southern Illinois University, Carbondale
University of Southern Mississippi
Stanford University
University of Texas, Arlington
University of Texas, Austin
Texas Tech University
University of Toledo
University of Toronto
Utah State University
Valdosta State University
Vanderbilt University (Owen)
Villanova University
University of Virginia (McIntire)
Virginia Commonwealth University
Wake Forest University (Babcock)
Wake Forest University
Washington University, Saint Louis
University of Washington
Washington State University
West Georgia College
Western Carolina University
Western Illinois University
Western Kentucky University
Western Michigan University
University of Wisconsin, La Crosse
University of Wisconsin, Madison
University of Western Ontario
Yale University

2 Profile of Surveyed Schools

2.1 Demographics

Table 2 displays general information about the 128 schools that participated in this year's Survey and the schools that participated in 1984 and 1985. As can be seen from the table, the 1985 and 1987 samples are very similar. There were about twice as many public as private institutions, with almost all the schools offering both an undergraduate and graduate business degree. A full range of school sizes in terms of full-time-equivalent (FTE) students, from the very small to the very large, were almost equally represented. Just over one-third of the schools had their own mainframe or minicomputer facilities within the business school. Information on student computer fees was collected for the first time in 1987. Appendix 1 lists information on enrollment, budget, and staff ratios on a school-by-school basis for the 1987 schools.

2.2 Budgets

A set of questions were asked relating to budget allocations for the school as a whole and for computer acquisitions and operations. The reader is cautioned to interpret the data in this section with care as there appears to be more ambiguity here than any of the other areas. Some schools indicated with explanatory notes that they omitted certain operational budget items or that they included items which were beyond the scope of the question. For example, for some schools, the boundary between computer operations and MIS instruction is not clear. Some schools indicated that they included faculty salaries for those that taught computer courses. Others indicated that accurate budget data was too difficult or time consuming to obtain. Thus, the lack of consistency in the budget data makes interpretation difficult.

For the three budget figures requested, schools reported various combinations. For example, a school may have reported its total school budget, but not the computer budget, or conversely, the computer operating budget but not the total or equipment budgets. Specifically, 98 schools (77%) reported total school budgets, 88 schools (69%) reported computer operations budgets, 80 schools (63%) reported both total and computer operations budgets, and 105 schools (82%) reported equipment acquisition budgets.

For the 80 schools reporting data on both total and computer operation budgets, on average, the computer operations budget was approximately three and a third percent of the total school budget, up slightly from 3.0 in 1985. The range in absolute dollars was extremely wide ($2,000 to $3,800,000).

To provide a more meaningful basis of comparison, the annual computer operating budget expenditure was converted into a per student statistic by dividing the total student FTE by the stated computer operating budget. For the 82 schools reporting data, the median quartile expenditures-per-student were $497, $131, $45, and $11, respectively, as shown in Figure 1. The median expenditure-per-student across schools changed very little between 1987 and 1985, $98 and $93, respectively. However, if the data displayed in Figure 1 are representative of all business schools, then it appears that the discrepancy between the schools in the first and fourth quartile has grown in the past two years. In 1985, the ratio of first to fourth quartile schools was 25, while in 1987 it was *45 times* more

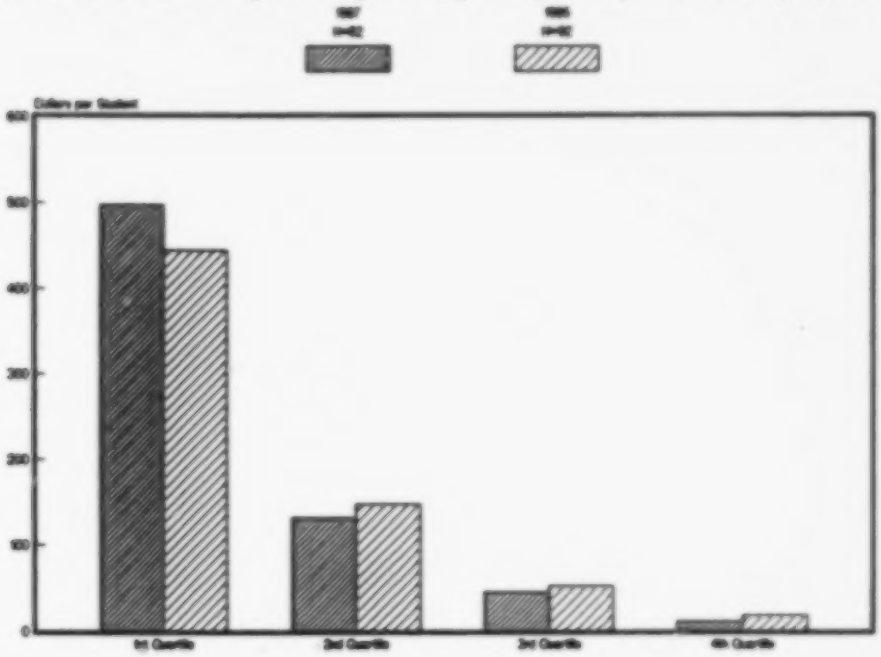
Table 2
Demographics of Surveyed Schools

	1987 N=128	*1985* N=125	*1984* N=35
Participating Schools			
Public Institutions	67%	69%	49%
Private Institutions	33%	31%	51%
Degrees offered			
Undergraduate only	2%	2%	0%
Undergraduate and Graduate	85%	86%	66%
Graduate only	13%	12%	34%
Student Enrollment (FTE)			
Less than 1000 students	25%	22%	37%
Between 1000 and 2000	27%	22%	23%
Between 2000 and 3000	24%	26%	20%
More than 3000 students	24%	30%	20%
Student Computer Fees*			
None	76%		
Per year	15%		
Per course	9%		
Mainframe/Mini Facilities Available			
Both School and University	29%	27%	54%
School only	7%	4%	6%
University only	60%	64%	40%
No data	4%		

* Data first collected in 1987.

per student.

Figure 1: **Median Computer Operating Budget Expenditure by Quartiles**



The schools were also asked to specify the *sources of funding* for hardware and software acquisition, and for computer operations and maintenance. Schools were classified according to the criterion that at least 50% of their funds came from a given source. Table 3 indicates that for 48% of the responding schools, at least half of their acquisition funds came from the school or university. Sixty-four percent of the schools were responsible for funding for at least half of their operational budgets. The table also suggests that vendors and other private donors are more likely to contribute toward the acquisition of hardware and software than toward ongoing support. Finally, the table indicates that students fees are being used slightly more in support of operations and maintenance than for acquisitions.

3 Computer Resources

For the purposes of this report, *business school computer resources* are broadly defined to be any and all equipment directly available for use by the school's faculty, students, and staff, whether or not the equipment is owned or operated by a central campus organization or the business school itself, and all business school staff assigned to support computing in the school.

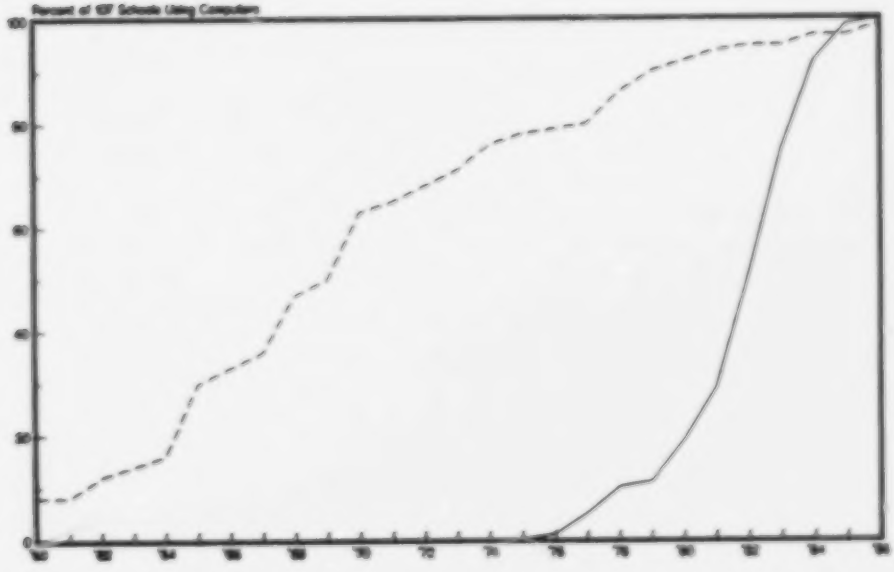
The schools were asked to report the year that computers were first used in their program. The results for the 107 schools that responded to this question are displayed in Figure 2. From the Figure it can be seen that the growth of mainframe and minicomputer usage has evolved over a period greater than 25 years while microcomputers have achieved

Table 3
Sources of Funding
(Percent of Schools)
(N = 124)

At least 50% from:	HW & SW Acquisition	Operation & Maintenance
B-School or University	48%	64%
State/Government	17%	14%
Vendor	9%	2%
Private Contributions	14%	4%
Student Fee	2%	5%

the same penetration in less than 10 years. The data indicated that it took 14 years for the first 20 schools to begin using mainframes, but only 5 years for the first 20 schools to introduce microcomputers.

Figure 2: **Access to Computing by Year**



In this section, mainframe/mini and staff resources will be discussed, with microcomputer and communications resources discussed in Sections 4 and 5.

3.1 Mainframe and Minicomputer Equipment

One hundred twenty-three of the responding schools (96%) indicated they had the use of multi-user time-sharing systems. Nine of these schools indicated they used only their own computer systems, 37 schools used both their own and university systems, and the remaining 77 schools relied exclusively on university systems.

The 46 business schools with their own minicomputer systems account for 78 individual computers. Table 4 displays the make, model, and number of these systems which are used by at least three or more schools.

Table 4
Business School Minicomputer Systems Installed
(Number of systems)

Make (at least 3)	*1987* N=46	*1985* N=39	*1984* N=33
AT&T			
3Bx	3	0	0
Digital			
DEC 10s,20s	3	7	7
VAX 11/7xx	17	10	7
VAX 8xxx	4	0	0
MicroVAX	5	0	0
Hewlett Packard			
HP3000s	11	8	6
IBM			
4300s	13	9	2
S36,38	3	1	0
NCR			
8750, 9300, Tower	3	3	0
PRIME			
7xx, 8xx, 9xxx	3	4	2
UNYSIS			
Burroughs SE 5xx	3	2	0
XE-550	3	0	0
WANG			
VS, OISs	5	3	6
Others (1 each)	4	12	7
Total	80	59	37

Although 12 vendors were represented, Digital Equipment Corporation had the largest number of systems installed, with 29 (36%) of the total. The VAX 11/7xx was reported to be the most installed computer (with 17 in use), followed closely by IBM 4300s (13) and Hewlett Packard 3000s (11). Appendix 2 provides detailed information on the make and model of the mainframe and minicomputers available to the schools. Thirteen schools reported having a port selector to enable users to access more than one mainframe/mini system.

3.2 Computing Staff

An extremely important dimension of a school's computer resource is its staff support. The respondents were asked to distribute their total staff FTE into three categories: *technical*, including operations support and programmers; *user services*, including training, consulting, and application support; and *overhead*, including computer center management and secretarial support. Ninety-two schools provided usable data. As a measure of this resource, the ratio of student FTE per total computer staff FTE was calculated. Figure 3 displays the students-per-staff FTE ratios by quartiles for the responding schools. For the 1987 sample, the median ratios for each quartile were 59, 203, 455, and 1092, respectively. From the Figure it can be seen that there is considerable improvement in the ratios between the 1985 and 1987 data. This clearly suggests that schools are investing more staff resources per student in support of the computer effort. However even with this improvement, the disparity between the first and fourth quartiles is once again dramatic.[3]

Table 5 displays details as to how schools allocated their staff among the three categories. From the Table it can be seen that in 1987, three percent of the schools had at least 75% of their total staff in the technical support role, a decrease from 11% reported in the 1985 data. In general, considering all changes from 1985 to 1987, there appears to be a shift from technical to user support — a technical decrease in the first quartile and user decrease in the fourth, and both technical and user support increases in the third. All other staff allocations have remained about the same.

3.3 Computing Services

Figure 4 displays the services provided by the business school computing staff for 1985 and 1987. The categories in the Figure include *Operations*, installation and operational support of microcomputers; *Software* and *Hardware*, assistance in selection and acquisition of microcomputer software and hardware, respectively; *Training*, workshops and training sessions; *Admin*, support of business school administrative computing; *Fac Pgm*, programming and statistical support for faculty; *Curr Dev*, courseware development support for faculty; and *Student Pgm*, programming and statistical support for students. The graph indicates that there have been increases in every category except for student statistical and programming support. This is consistent with the data displayed in Table 5.

[3]There is an apparent inconsistency between the data shown in Figures 1 and 3. Figure 1 suggests that the operating dollar allocation per student for computing during the past two years has decreased for the second, third, and fourth quartiles, but Figure 3 suggests that the student-per-staff ratios have decreased (which suggest a greater dollar expenditure). This may be a result of sampling error or simply indicates that staff, in terms of FTE, are easier to count than dollars.

Figure 3: **Median Staff Support of Computing by Quartiles**

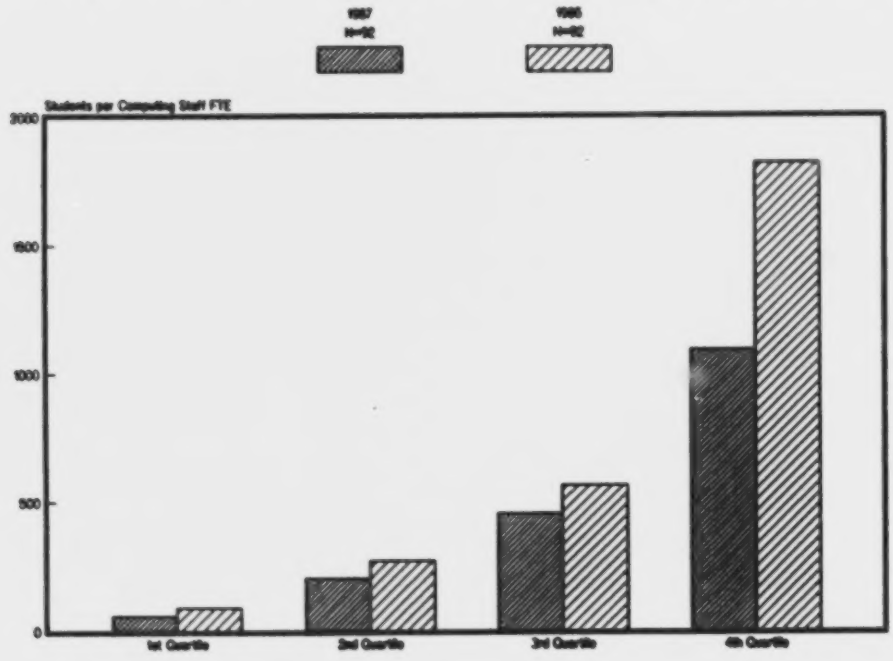
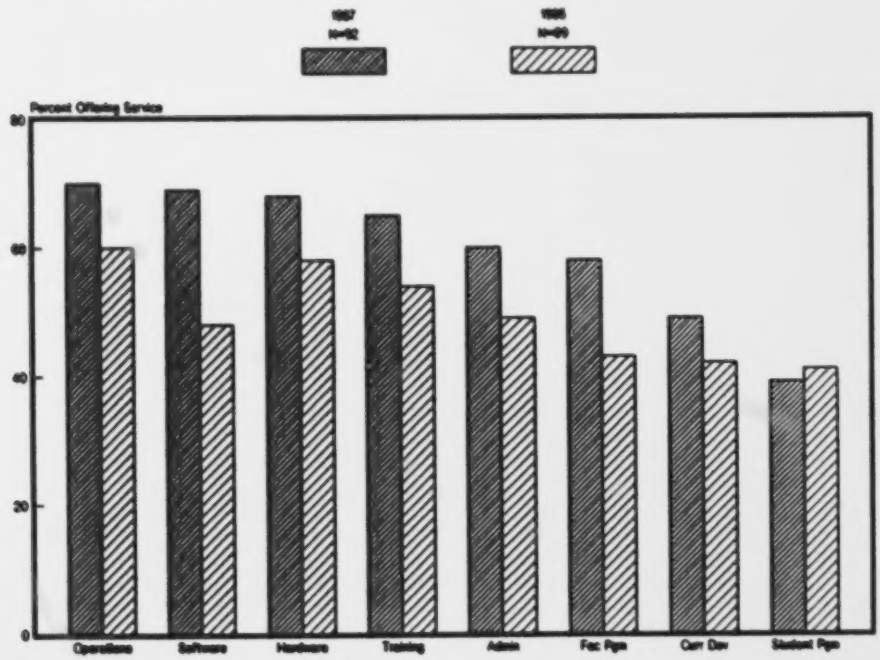


Table 5
Staff Allocations
(Percent of Schools)
(1987 N = 92, 1985 N = 89)

	Technical		User		Management	
FTE Allocation	*1987*	*1985*	*1987*	*1985*	*1987*	*1985*
At least 75%	3%	11%	22%	22%	5%	8%
From 50% to 75%	14%	12%	29%	31%	4%	2%
From 25% to 50%	43%	34%	33%	22%	21%	16%
Less than 25%	39%	43%	16%	24%	70%	74%

Figure 4: **Services Provided by Computing Staff**



4 Microcomputers

As was shown in Figure 2, the most significant area of computer growth in recent years has been in the use of microcomputers. In the 1984 and 1985 surveys, 94% of the schools reported having microcomputers, while in the current survey, 100% of the schools indicated that they have microcomputers available for faculty or student use. The schools reported having totals of between 8 and 648 microcomputers, with quartile values of 37, 79, 129, and 218, respectively. Appendix 3 presents detailed microcomputer-related information on a school-by-school basis.

For purposes of this report, only microcomputers for which the school reported at least four of the same model were counted. For each model, the respondents were also asked to state an *endorsement* of the systems, how they felt about the equipment: Did it meet their expectations? Was it well supported by the vendor? Would they recommend it to others? A single endorsement value was requested using a five point scale, with 5 being the strongest general endorsement and 1 the lowest. Not all respondents provided endorsement data.

4.1 Models and Market Penetration

Table 6 displays the variety of microcomputers found in the schools. In total, 25 different models of microcomputers were listed. Eighty-six percent of the schools reported having IBM PC or PC/XT, 35% IBM PC/ATs, 30% Zenith, and 26% Macintosh systems. All the other models were concentrated in ten percent or less of the schools. Note that there

was an increase in percentage of use of all models except for the Apple II series, the DEC Rainbow, and the Tandy.

Table 6
Microcomputer Systems Installed by Model
(Percent of schools)

Model (at least 4 systems)	*1987* $N = 128$	*1985* $N = 119$
IBM PC, PC/XT	86%	82%
IBM PC/AT	35%	5%
Zenith	30%	10%
Macintosh	26%	13%
Apple II series	10%	16%
HP 150s	10%	4%
HP Vectra	9%	3%
Unisys	8%	4%
AT&T	6%	0%
DEC Rainbow	6%	13%
NCR	5%	0%
Wang	4%	0%
Xerox	4%	0%
Tandy	2%	10%
Other vendors	31%	19%

Seventeen percent of the schools had only one model of microcomputer, 35% had two models, 24% had three, and 13% had four models. Eleven percent of the schools reported actually supporting five or more different models.

Table 7 displays the total number of installed microcomputers for the models for which at least 200 systems were reported. The total number of systems has grown 75% from 9,556 in 1985 to 16,725 in 1987. In reviewing the growth curve in Figure 2, it may be seen that the rapid entry of microcomputers into the schools occurred between 1983 and 1985, and even though the entry rate slowed between 1985 and 1987, a significant number of additional systems were acquired by the schools. Note that in Table 7, the IBM PC/AT and Zenith AT-compatible systems gained market share while other models either remained the same or lost market share. This further substantiates the general impression that IBM dominates the business school market and that the PC and PC/XT models are being replaced by the newer AT models. Zenith has shown the most dramatic growth during the past two years, increasing from 4.3 to 11.0 percent. Macintosh showed no substantial change in market share.

The endorsement data for microcomputers provided by the responding schools is also included in Table 7. From the Table it may be seen that five models received an endorsement of 4.0 or higher, with the relatively small standard deviations indicating agreement among the respondents.

Table 7
Microcomputer Systems by Market Penetration
(Number of systems)

	1987			*1985*	
Model (at least 200 systems)	Market share		Endorsement (st. dev.)	Market share	
IBM PC,PC/XT	7,509	(45%)	4.1 (0.9)	5,120	(54%)
Zenith	1,791	(11%)	3.9 (1.0)	411	(4%)
IBM PC/AT	1,194	(7%)	4.2 (1.0)	259	(3%)
Macintosh	925	(5%)	4.3 (1.0)	457	(5%)
Unisys	593	(4%)	3.1 (1.5)	544	(6%)
DEC Rainbow	585	(4%)	2.2 (1.4)	855	(9%)
HP Vectra	349	(2%)	4.2 (0.9)	40	(0%)
HP 150	303	(2%)	2.4 (0.8)	230	(2%)
Others	3,476	(20%)		1,640	(17%)
Total	16,725	(100%)		9,556	(100%)

4.2 Microcomputer Densities

As a measure of the penetration of microcomputers into the school, two ratios were calculated. The first, a student-per-micro ratio, was calculated by dividing the total student FTE by the number of the school's microcomputers available for student use. The second ratio, faculty-per-micro, was calculated by dividing the faculty FTE by the number of the school's microcomputers available exclusively for faculty use. Note that these ratios do not take into account microcomputers owned by faculty or students. Thus the denominators in the ratios are probably understated and hence the actual ratios are probably better (i.e., lower) than reported.

For the 116 schools with usable data, the median student-per-micro density, by quartiles, were 11, 28, 46, and 86, respectively, as shown in Figure 5. The median faculty-per-micro densities were 0.9, 1.2, 2.3, and 6.9, for 119 schools, as shown in Figure 6. These figures also highlight the radical expansion of the availability of microcomputers within the schools. The student densities improved between 1985 and 1987 by an average of 50% across the four quartiles while the faculty densities improved even more dramatically, 64%.

4.3 Acquisition and Ownership

Regarding student purchase of microcomputers, this year's data were similar to the 1985 data. In 1985, only Harvard reported that it required all its students to have their own microcomputers. Two others reported partial requirements: Boston University required micro purchases for MIS majors and Purdue required them of executive program students. For the schools participating this year, only Drexel University required all its students to purchase micros and, once again, Boston University for MIS students. Twenty-three

Figure 5: **Student Microcomputer Density by Quartiles**

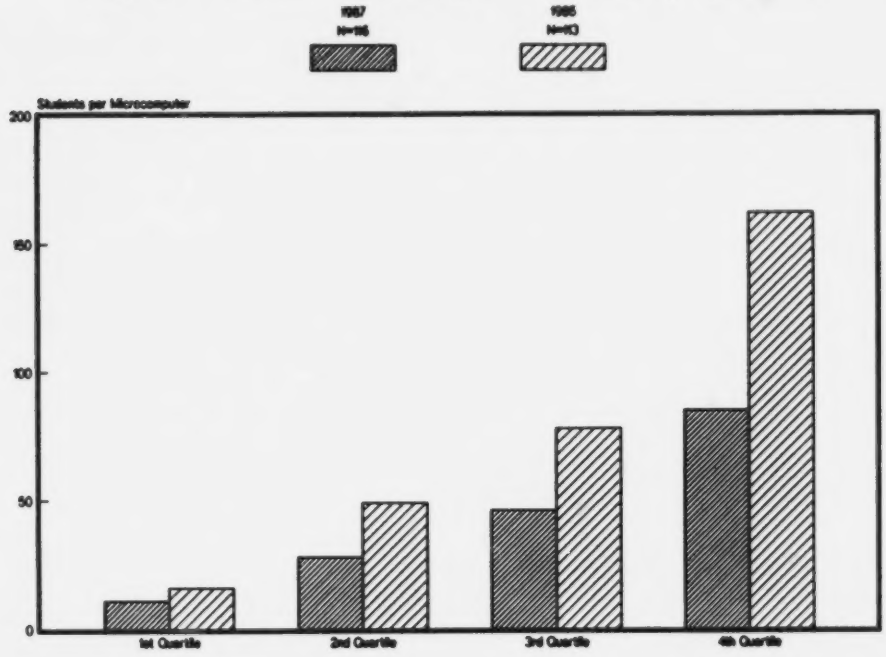
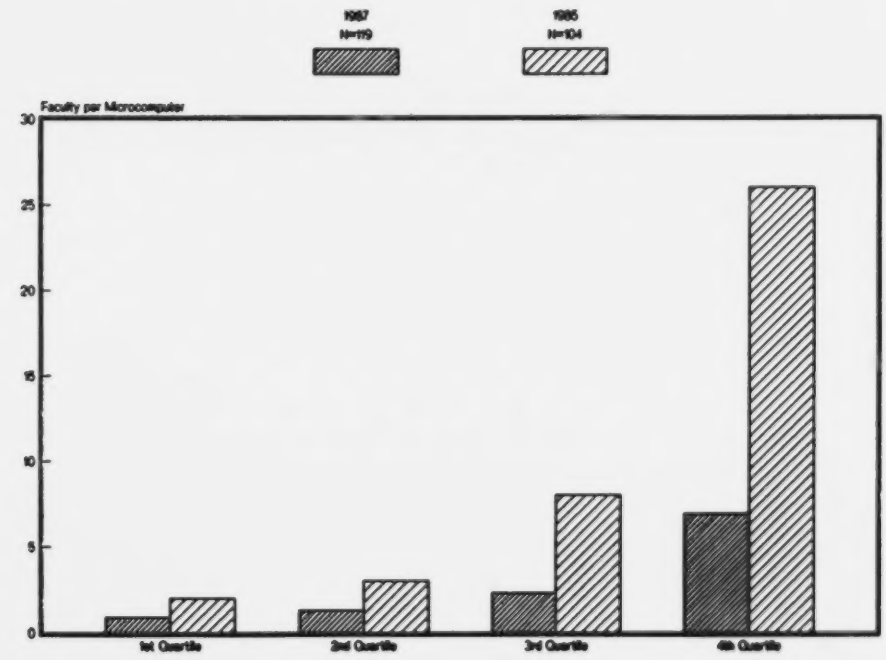


Figure 6: **Faculty Microcomputer Density by Quartiles**



other schools (including Harvard) indicated that they are now recommending ownership. Fourteen of these schools specified IBM PC or compatible systems, five Zenith, and one each for AT&T 6300s, Macintosh, and/or HP Vectra systems. Five schools indicated they are planning to require ownership starting in Fall 1987.

The responding schools indicated that faculty microcomputer systems were acquired through a combination of the following methods: 34% reported that faculty were responsible for purchasing their own system at market prices, 49% reported that faculty could purchase a system at a discount through the business school, and 67% indicated that the schools provided these systems. For those schools that provided systems, about 50% of the schools said that faculty could take school-owned systems off campus.

4.4 Portable Systems

A new area of investigation with the 1987 Survey was the introduction and use of portable microcomputers. Based on a criterion of at least 15 portable systems each, eighty-two schools (64%) indicated that they had acquired a total of 1,627 systems. Of these, 541 (33%) are used exclusively by faculty. Table 8 displays the five models for schools which had at least 15 systems, ranked by the percentage of schools which were using them. The Table also displays the number of systems and their average endorsement. From the Table it can be seen that although the HP110 series is by far the most numerous single system, the IBM, Compaq, and Zenith are more widely dispersed among the schools. Zenith received the strongest endorsement, followed closely by Compaq and NEC.

Table 8
Portable Microcomputer Systems
(Percent of Schools)

Model (at least 15 systems)	N = 82	Market share		Endorsement (st. dev.)
IBM Convertible	27%	226	(14%)	3.2 (1.1)
Compaq	23%	151	(9%)	3.9 (1.1)
Zenith	23%	77	(5%)	4.0 (0.9)
HP 110, 110 plus	11%	1,076	(66%)	2.6 (1.2)
NEC	2%	28	(2%)	3.7 (1.2)
Other	16%	69	(4%)	
Totals		1,627	(100%)	

5 Communications

Corresponding to the explosive growth in the number of microcomputers is the growth of communications capabilities. In 1985, 22 (18%) schools reported having both local area networking (LAN) and wide area networking (WAN) capability, while 62 (48%) schools

now have reported this capability. The number of schools with just local area networks decreased from 27 to 22, and those with just wide area networks remained the same, 21. When looking at the number of local area and wide area networks together at one school, there is no apparent pattern of simultaneous development. Some schools indicate more activity in the area of local area networking and less in wide area networking. Others are completely opposite, or more evenly balanced. The two technologies appear to be developing independently.

5.1 Terminal Communications

Although "dumb" terminals are increasingly giving way to intelligent terminals and microcomputers with communications capability, there are still a number of schools that use terminals as a means of access to computing. As a measure of the "terminal density," the number of students-per-terminal was calculated. The median student-per-terminal values, by quartile, were 30, 64, 143, and 319, respectively. Interestingly, these values are almost identical to the 1985 quartile data (34, 82, 143, and 314, respectively) which indicates that schools are neither adding new terminals nor getting rid of old ones. Furthermore, in every case these ratios are about three times larger than the quartile data reported for student microcomputer availability (11, 28, 46 and 86, respectively). For almost all of the schools in the Survey, access to microcomputers is now more widespread than access to terminals linked to a mainframe/mini.

5.2 Microcomputer Communications

The schools were asked to indicate whether they used their microcomputers as "stand-alone" devices or whether some communications capability was available, i.e., hardwired as a terminal, via dial-up with telephone and modem, or linked to other microcomputers via a local area network. Figure 7 displays these data, and shows the dramatic shift toward providing connectivity. The last column of Appendix 3 lists the percentage of microcomputers which are hardwired and/or LANned on a school-by-school basis.

5.3 Local Area Networks

Eighty-four schools reported having some type of local area networking (LAN) capability, thus providing direct communications among microcomputers. The LANs mentioned at least three times, together with their endorsements, are listed in Table 9. From the Table it may be seen that Ethernet is still the most common network, but that several others have made significant gains in the past two years. For example, Novell, Apple Talk, Decnet, and IBM PC Net are all installed in at least 20% of the schools, more than doubling their previous base. Also, IBM Token Ring, introduced in late 1985, is now installed in 12% of the schools. Note that only two types of LANs, Novell and Ungermann Bass, had endorsements of greater than 4.0.

For the 84 schools with LANs, 38 (45%) had installed only one LAN, 18 schools (21%) used two different LANs, 16 school (19%) had three, and 12 schools (14%) had four or more different networks.

Figure 7: **Microcomputers with Communications Capability**

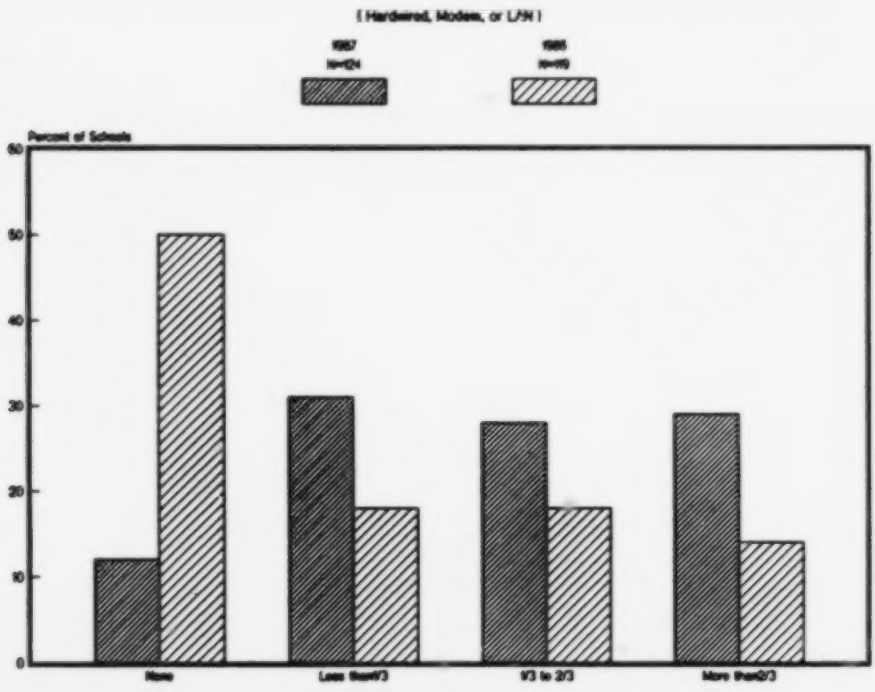


Table 9
Local Area Networks Installed
(Percent of schools)

	1987		*1985*
Type of LAN (at least 3)	N = 84	Endorsement (st. dev.)	N = 49
Ethernet	40%	3.7 (1.4)	24%
Novell (Arcnet or Netware)	26%	4.4 (0.9)	12%
Apple Talk	23%	3.6 (1.1)	6%
Decnet	20%	3.9 (0.8)	6%
IBM PCnet	20%	2.6 (1.3)	4%
IBM Token Ring	12%	3.9 (1.1)	0%
Starlan	7%	3.2 (0.8)	0%
Corvus	7%	2.2 (1.6)	12%
Ungermann Bass	6%	4.3 (0.6)	0%
Unisys	4%	3.7 (1.2)	4%
Others	31%		41%

The schools with LANs were asked to identify the networking applications and whether these applications involved a host mainframe/mini or were just among the microcomputers. Their responses are summarized in Table 10, ranked by percentage of mainframe/mini applications. The data in the Table suggests that the networks are used for different functions. For example, electronic mail, database access, and document transfer were the most widely used host applications, while the file and print server applications, document transfer, and software distribution led in the microcomputer environment. The Table also suggests that more schools are using a host system as part of their networking strategy than relying solely on communications among microcomputers. Appendix 3 details host and/or micro communications linkages on a school-by-school basis.

Table 10
Local Area Network Applications
(Percent of schools)
(N = 84)

	Communications	
Application	With a host	Among micros
Electronic mail	75%	33%
Database access	69%	33%
Document transfer	68%	41%
Print server	61%	43%
File server	54%	48%
Software distribution	44%	40%
Disk backup and restore	26%	24%
Calendaring	24%	10%
Electronic conferencing	1%	6%

5.4 Wide Area Networks

Just as LANs are providing communications within schools, wide area networks (WANs) are providing communications between schools or access to external database services. Eighty-three schools reported having at least one wide area network available. (Sixty-two of these 83 schools also had LANs.) The WANs mentioned at least three times, together with their endorsements, are listed in Table 11. It appears from the Table that BITNET has become almost ubiquitous, and that, with an endorsement of 4.0, the users are quite satisfied with this capability.

For the 83 schools with WANs, 37 (45%) had access to only one, 20 schools (24%) used two different WANs, 17 schools (20%) had three WANs, and 9 schools (11%) had four or more different networks.

Table 11
Wide Area Networks Installed
(Percent of schools)

	1987		*1985*
Type of WAN (at least 3)	N = 83	Endorsement (st. dev.)	N = 42
BITNET	90%	4.0 (1.0)	67%
ARPANET	31%	3.7 (0.9)	19%
UUCP (UNIX)	19%	3.2 (1.1)	0%
CSNET	19%	3.0 (1.3)	10%
Compuserve	17%	3.7 (0.8)	19%
EDUNET	7%		14%
The Source	6%	2.8 (1.3)	7%
MCI Mail	5%	4.0 (1.4)	0%
Others	15%		14%

6 Software

The respondents were asked to list the principal software packages used in their schools for twelve different categories and to specify whether the software was used for instruction or research, and on a mainframe/mini or a microcomputer. For each category the number of schools which reported using a package was tallied. Table 12 lists the software for which substantial agreement exists across schools. Note that each category has a different number of schools ("*N*") since some schools did not report software for that category. The count of the software reflects the number of times a package was reported. The "other" listing in each area represents the total number of times packages not identified by name in the Table were reported. Thus, the counts in any category may add up to more than "*N*."

An overall analysis of the software usage data suggests that statistical and simulation applications are used more predominantly on mainframe/mini systems. On the microcomputer side, word processing, spreadsheets, database management systems, and integrated packages are the dominant applications, and for all except integrated packages, a single package has achieved a leadership position. Mathematical modeling, business games, and programming seem more equally divided between the two environments. While graphics was predominant on microcomputers and electronic mail systems on mainframe/mini systems, no software package has yet achieved wide spread acceptance in these areas.

6.1 Word Processing

It appears that word processing has migrated from the mainframe/mini environment to microcomputers with more than twice as many schools reporting using microcomputer-based packages (45 to 113 schools). Although there were 32 different word processing packages reported for microcomputers, it appears that WordPerfect has achieved a lead-

Table 12

Computer Software Usage

(N = Number of schools reporting software package)

MAINFRAME/MINI				MICROCOMPUTER			
Instruction		**Research**		**Instruction**		**Research**	
N = 45		Word Processing					N = 113
SCRIPT	11	SCRIPT	13	WordPerfect	52	WordPerfect	57
Other	35	Other	50	WordStar	29	WordStar	32
				MS Word	15	MS Word	21
				PC-Write	16	MultiMate	11
				Other	66	Other	68
N = 17		Spreadsheets					N = 111
IFPS	4	IFPS	3	Lotus 1-2-3	111	Lotus 1-2-3	79
20/20	3	20/20	2	SuperCalc	17	SuperCalc	7
Other	5	Other	3	Other	46	Other	14
N = 57		Database Management Systems					N = 108
SQL	9	SQL	10	dBase II/III	81	dBase II/III	56
INGRES	9	INGRES	8	R:base	23	R:base	14
ORACLE	7	System 10xx	6	PC-File	6	PC-File	5
Other	32	Other	15	Other	47	Other	26
		Integrated Packages					N = 56
				Symphony	19	Symphony	22
				Framework	20	Framework	14
				Enable	10	Enable	2
				Other	5	Other	5
N = 116		Statistical Packages					N = 85
SPSS	69	SPSS	89	SPSS	17	SPSS	23
SAS	62	SAS	75	SAS	13	SAS	13
Minitab	32	BMPD	22	Minitab	13	SYSTAT	9
Other	51	Other	34	TSP	10	Other	36
				Other	42		
N = 80		Mathematical Modeling					N = 71
LINDO	38	LINDO	30	LINDO	35	LINDO	22
IFPS	39	IFPS	19	IFPS	26	IFPS	15
Other	15	Other	12	Other	35	Other	21
N = 55		Simulation					N = 30
GPSS	31	GPSS	18	SIMAN	6	SIMAN	6
Simscript	12	Simscript	10	SLAM	4	SLAM	4
SLAM	11	SLAM	9	GPSS	3	Other	11
Other	5	Other	7	Other	10		
N = 51		Business Games					N = 32
Markstrat	19			Markstrat	12		
Other	41			Other	25		
N = 74		Programming Languages					N = 93
COBOL	54	FORTRAN	43	BASIC	73	BASIC	46
BASIC	44	BASIC	27	Pascal	26	Pascal	35
FORTRAN	32	COBOL	20	COBOL	16	FORTRAN	30
Pascal	31	Pascal	21	C	14	C	16
Other	44	Other	48	Other	32	Other	29

ership position replacing WordStar as the dominant package. This was the only major software shift which occurred among the twelve categories. Most of the other packages retained their relative positions. However, the fact that over 30 different word processing packages were listed for use with microcomputers suggests that WordPerfect is not the universal choice.

6.2 Spreadsheets

For spreadsheets, Lotus 1-2-3 dominates the field, being named by every school reporting. No other software in the microcomputer or mainframe/mini environments shows anywhere near this penetration. There were 13 other different microcomputer based spreadsheet packages listed, and with the exception of SuperCalc, none were named more than five times.

6.3 Database Management Systems

Nearly twice as many schools (108 to 57) reported using database management system (DBMS) on microcomputers as compared with on mainframe/mini systems. Cost and ease of use are probably the reasons for the widespread use of the these systems on microcomputers. However, what is not clear from the data is which systems are receiving more use and whether there is a shift away from the minicomputer environment toward microcomputers. In 1985, 42 schools reported mainframe/mini packages and this has increased to 57, and on the microcomputer side, their has been a similar increase from 85 to 108 schools. For mainframe/mini systems, 23 different packages were named with no one package really dominating the field. Besides SQL, INGRES, and ORACLE, three other packages were named three times each, and fifteen packages were mentioned once.

In the microcomputer environment, 22 different packages were named, but it appears that dBase II/III continues to dominate the field.

6.4 Integrated Packages

Integrated packages like Symphony and Framework, which combine spreadsheets, word processing, and database management, have not achieved the acceptance predicted for them, being found in less than half the schools. Furthermore, neither package has achieved a dominant position in the business school market. Thirteen of the 56 schools listing integrated packages named both Framework and Symphony, with the remaining schools listing only one package.

Since integration of various applications is still stated as a desired goal, it will be interesting to see if "integrating" packages with windowing capability emerge in this area.

6.5 Statistical Packages

This year's Survey shows the continuing dominance of the mainframe/mini computers for statistical and mathematical modeling, although the number of schools reporting microcomputer packages has more than doubled (34 to 85). SPSS still leads in all areas, but other packages also have a strong following, and very few schools mentioned using only one

package. The need for significant internal storage and processing speed to accommodate the mathematical manipulations involved in calculating the various values may explain the dominance of the mainframe/mini packages. This may change as larger and more powerful microcomputers enter the market.

6.6 Mathematical Modeling

It appears that LINDO and IFPS dominate the mathematical modeling area in both the mainframe/mini and microcomputer environments. Furthermore, it appears that mathematical modeling is occurring in both environments with about the same frequency. If the occurrence of software packages is used as an indicator, than this has indeed been an active area. In the microcomputer area, in 1985, five packages were identified for instructional use with a total of 27 occurrences. In 1987, 21 different packages were identified for a total of 96 occurrences. Of the 21 packages, LINDO and IFPS account for 61 occurrences, with Storm, QSB, and What's Best each being listed five times.

On the mainframe/mini side, there has been no increase in the names of packages mentioned (about 8 each year), but the frequency of listing the packages increased from 67 to 92 occurrences for instruction and 48 to 61 for research.

6.7 Simulation

Simulation packages remain prominent in the mainframe environment, with GPSS the clear leader.

6.8 Business Games

There were 28 different mainframe/mini based business games listed for instructional use, with Markstrat being mentioned 19 times, Marksim 4 times, and all the rest once or twice. A microcomputer version of Markstrat was mentioned 12 times, Micromatic twice, and 12 others once.

6.9 Programming Languages

This is an area for which a major shift in the computing environment has occurred. In 1985, 95 schools listed programming languages for their mainframe/mini systems while in 1987, this number has decreased to 74 schools, a 22% decrease. Conversely, for microcomputers, the numbers for 1985 and 1987 are 75 and 93, respectively, a 24% increase. Apparently, both faculty and students have a preference for doing their programming on microcomputers.

COBOL and BASIC have retained their dominant positions for instructional purposes in the mainframe/mini environment, while BASIC is the undisputed leader on microcomputers. For researchers, FORTRAN is the most popular on larger machines while BASIC again seems to have a dominant position on microcomputers.

6.10 Graphics

The graphics area is emerging and being dominated by microcomputer software. In the 1985 Survey, the data were very fragmented and no specific conclusions could be drawn. Unfortunately, the case this year is about the same. Ten mainframe/mini packages were listed with 19 occurrences. SAS Graph dominated and was named 10 times.

In the microcomputer environment, 70 schools listed 23 different graphics packages (not counting packages which are part of a spreadsheet package, such as graphics produced by Lotus 1-2-3). Chartmaster led the list with seven occurrences, MacDraw/MacPaint was was named six times, Freelance four times, HP Graphics Galley three times, and 19 other packages each mentioned once.

7 Instruction and Research

Relating to the instructional and research use of computing, questions were asked to determine the penetration of computing into the curriculum; how computer courseware is acquired; how students and faculty are trained on the use of the various software packages; whether a computer or information systems course or learning a programming language is required; and what databases are used.

7.1 Penetration into the Curriculum

The respondents were asked to indicate whether hands-on use of computing was required in their undergraduate and graduate core courses. (The course descriptions are those used by AACSB.) Specifically, data were gathered on whether required use occurred in none, some, or all sections. Figure 8 displays the responses for the core undergraduate courses and Figure 9 for the core graduate courses.

For this analysis, missing data was assumed to mean "no sections required computer use." An examination of the graphs indicate that academic area usage patterns are very similar at both the undergraduate and graduate levels. At the undergraduate level, there was required computer use in at least two-thirds of the core courses for seven of the areas: Computers and Information Systems, Accounting, Management Science, Statistics, Finance, Production and Operations Management, and Marketing. At the graduate level, this was true for all but Marketing. At least one-third of the undergraduate Business Policy and Economics core courses have required computer usage, while this is true for Business Policy and Marketing at the graduate level.

To see the aggregate growth of required computer usage across the curriculum, the data from Figures 8 and 9 was compared with that from 1985, and are shown in Table 13. The net change for each academic area was calculated, and then averaged into an undergraduate and graduate total for each of the years. The Table shows an overall increase of a just over 8% in the number of schools with required computing in the core classes at the undergraduate level and just over 3% at the graduate level. As can be seen from the Table, the largest overall increases occurred in the Accounting, Finance, and Marketing areas at the undergraduate level and the Accounting and Business Policy at the graduate levels.

Figure 8: **Required Computer Use in Undergraduate Core Courses**

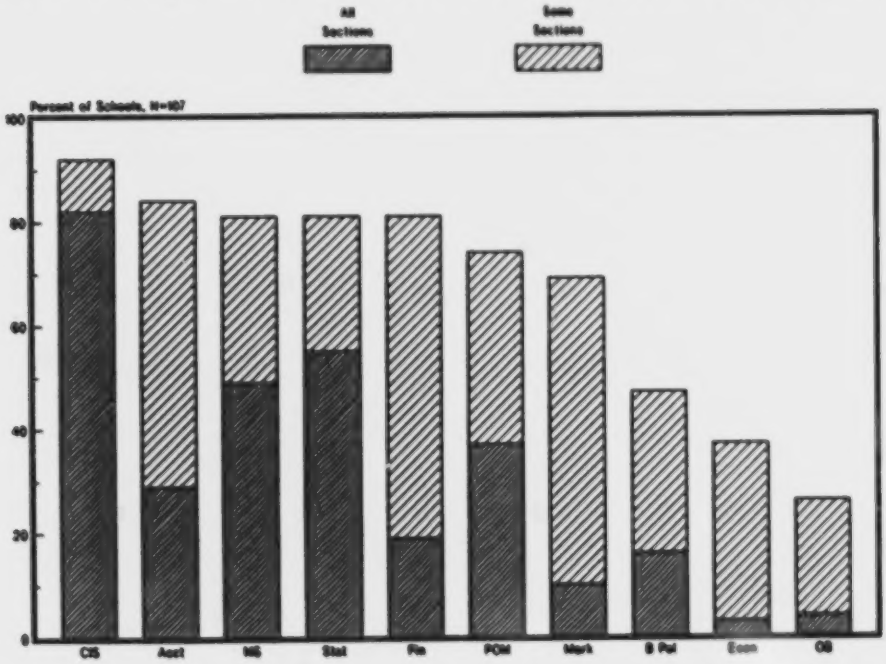


Figure 9: **Required Computer Use in Graduate Core Courses**

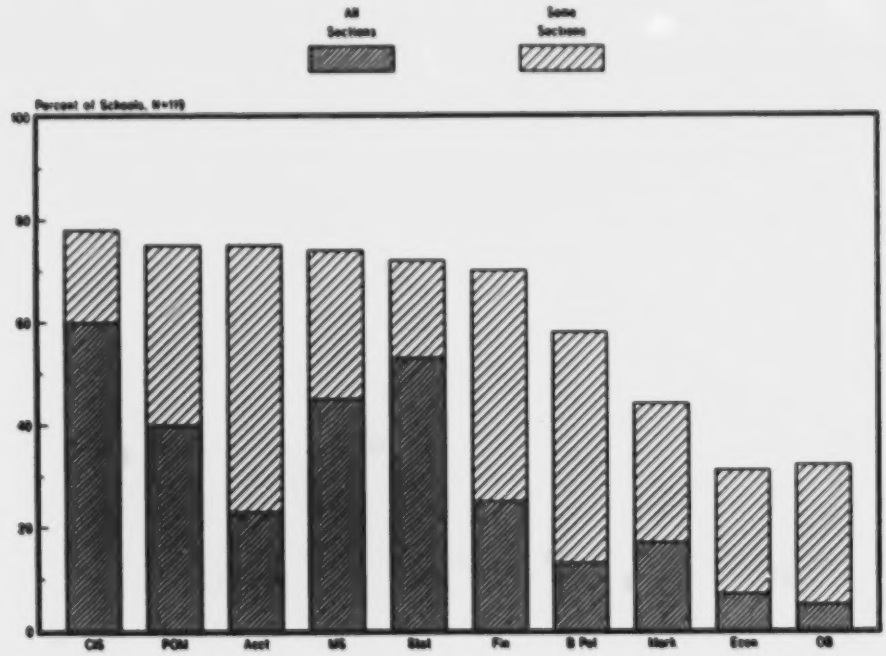


Table 13
Growth in Required Computer Usage in Core Courses
(Percent of schools with required computer use)

	Undergraduate			Graduate		
Core Course	*1987*	*1985*	Change	*1987*	*1985*	Change
Accounting	84%	62%	22%	70%	55%	15%
Business Policy	47%	42%	5%	44%	32%	12%
Economics	37%	29%	8%	31%	32%	- 1%
Finance	81%	64%	17%	75%	76%	- 1%
Information Systems	94%	87%	7%	78%	78%	0%
Organizational Behavior	26%	20%	6%	22%	21%	1%
Management Science	81%	82%	- 1%	74%	77%	- 3%
Marketing	69%	52%	17%	58%	55%	3%
Production/Operations	74%	78%	- 4%	75%	71%	4%
Statistics	81%	76%	5%	72%	69%	3%
Average	67.4%	59.2%	8.2%	59.9%	56.6%	3.3%

7.2 Sources of Courseware

For core courses for which a school indicated that there was at least some required computer use, the respondents were asked to indicate the source of the courseware used for that course. Specifically, they were asked if the courseware was developed internally, acquired with the textbook, acquired from commercial sources, or acquired from another university. Many schools indicated multiple sources for a particular course and some listed commercial packages such as Lotus as the courseware. Tables 14 and 15 summarize this information for the undergraduate and graduate core classes, respectively. The "*N*" values in the tables reflect the number of schools which indicated *at least some* required computer use. The source percent values across each line are based on that "*N*."

Both tables indicate that commercial software packages are currently the dominant source of courseware, and sharing among schools is minimal. A careful review of the tables indicates that at the undergraduate level, courseware is acquired with textbooks and developed internally at about the same percentages, while at the graduate level, it appears that more courseware is developed internally than acquired with the textbooks. This probably reflects the fact that most textbooks are written for the undergraduate audience.

7.3 Classroom Electronic Equipment

One hundred six of the schools (83%) indicated that their classrooms were equipped to display interactive computer output to their students either from terminals or microcomputers. Of these, 38 schools (36%) had permanently installed video projection equipment in at least 10% of their classrooms; 12 schools had such equipment in 25% of their classrooms; and three schools reported that 100% of their classrooms were permanently equipped with

Table 14
Sources of Undergraduate Courseware
(Percent of schools with required computer use)

Undergraduate Core Class	N	Internal	Textbooks	Commercial	Other Univ
Accounting	90	31%	42%	71%	6%
Business Policy	50	22%	24%	60%	6%
Economics	39	21%	13%	74%	0%
Finance	86	22%	23%	67%	3%
Information Systems	101	25%	29%	78%	8%
Organizational Behavior	27	33%	41%	52%	11%
Management Science	86	24%	35%	66%	6%
Marketing	74	22%	27%	69%	5%
Production/Operations	80	29%	25%	63%	8%
Statistics	87	22%	16%	78%	8%

Table 15
Sources of Graduate Courseware
(Percent of schools with required computer use)

Graduate Core Class	N	Internal	Textbooks	Commercial	Other Univ
Accounting	84	27%	23%	64%	5%
Business Policy	53	25%	19%	70%	8%
Economics	42	24%	10%	57%	0%
Finance	91	25%	12%	68%	4%
Information Systems	94	27%	27%	80%	10%
Organizational Behavior	26	31%	23%	50%	8%
Management Science	90	23%	28%	63%	6%
Marketing	71	24%	20%	59%	8%
Production/Operations	90	29%	18%	56%	8%
Statistics	87	20%	14%	69%	8%

computer display capability.

There was a heavy reliance on mobile units, with 25 schools reporting they had one mobile unit, 36 two, 20 three, 14 four, and 8 five or more.

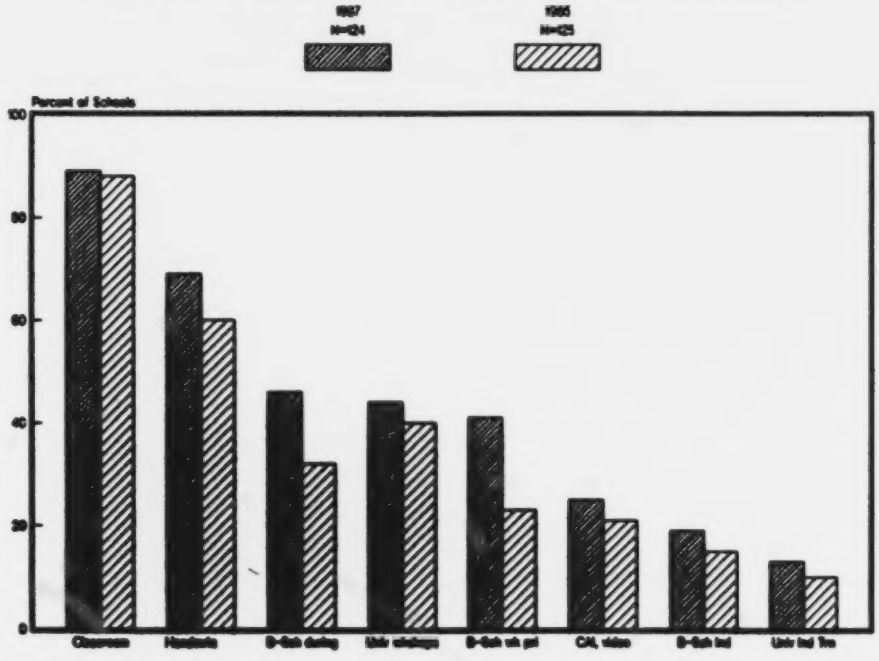
The video projectors that were specifically mentioned included Sony with 34, Electrohome with 18, and Limelight with 9. Sony was again the leading video monitor being specifically mentioned 13 times, followed by Zenith which was specified 8 times. The Kodak Datashow was the most popular LCD device used with overhead projectors, mentioned 39 times.

7.4 Training

The respondents were asked to indicate the various approaches used to train students and faculty in the use of computer software. Figure 10 displays the student data for 1985 and 1987. From the Figure it can be seen that classroom instruction continues to be the major form of training for students. However, there has been an increase in workshops offered by the business school both before and during the academic year.

For the faculty, handouts, workbooks, and other documentation was the most prevalent form of training (65%), followed by individual training provided by the business school (57%), and workshops (53%).

Figure 10: Types of Computer Software Training for Students



7.5 Computer Course and Language Requirements

As is shown in Table 16, of the 111 schools that have undergraduate programs and the

125 that have graduate programs, 106 (95%) and 100 (80%), respectively, reported requiring a course in computers or information systems. While these percentages are only a little higher than those of the earlier data, there has been a greater increase in the requirement of a computer language at the undergraduate level, from 54% to 70% between 1985 and 1987. At the undergraduate level, 66% of the schools required BASIC, while only 16% required COBOL. The graduate program showed a similar pattern, with a small increase in schools which required a computer language. Note that the selection of COBOL as a required computer language has decreased at both the undergraduate and the graduate levels, while BASIC has increased.

Table 16
Computer Course and Language Requirements

	Undergraduate		Graduate	
	1987 N = 111	*1985* N = 110	*1987* N = 125	*1985* N = 123
Required CIS Course	95%	91%	80%	75%
Required Language	70%	54%	41%	36%
Basic	66%	49%	55%	52%
COBOL	16%	25%	14%	20%
Pascal	15%		8%	
Fortran	8%		8%	

7.6 Databases Available for Instruction and Research

The most frequently mentioned databases for research and instruction were, in order of usage, Compustat (used at 71% of the schools), CRSP (54%), Citibase (27%), Value Line (22%), Dow Jones (21%), DRI (9%), and IMF (9%).

8 Administrative Activities

Table 17, ordered by the number of occurrences in the 1987 sample, shows that word processing was the clear leader in administrative applications. Unfortunately, data were not collected for this activity in the 1985 survey. While an overall increase was seen for all activities with budget preparation remaining dominant, student records was displaced in ranking by publications, alumni and development, and admissions.

9 Summary and Issues

This year's Survey has provided evidence to support the general impression that microcomputers have become a significant component in a school's resources. As the graph in Figure 2 on page 6 indicated, within the short space of just five years, there has been an

Table 17
Administrative Computer Use

Application	*1987* N=124	*1985* N=125
Word Processing	87%	
Budget Preparation	69%	56%
Publications	57%	34%
Alumni & Development	56%	38%
Admissions	56%	32%
Student Records	50%	42%
Registration & Enrollment	48%	37%
Class Scheduling	44%	32%
Direct Faculty Support	43%	26%
Faculty Records	40%	30%
Faculty Course Assignment	31%	26%
Contracts & Grants	23%	22%

increase from about 20% of the schools with microcomputers to 100%. These schools report a total of 16,725 desktop units and 1,627 portable computers. The number of desktop micros is nearly double the number reported in 1985 and the use of portables has grown from almost nothing two years ago to the point now where nearly two-thirds of all schools have some. The impact of this explosive growth in the sheer number of microcomputers creates many new issues and challenges related to funding, staff support, hardware, software, data, and strategic planning. Whereas mainframe/minicomputers were operated and maintained by experts removed from the user, and access was by remote terminal (and for many years, punched cards), microcomputers have now directly penetrated our offices, classrooms, and even our homes. Microcomputers are an integral part of our environment.

This Survey continues the effort to monitor the changing computer environment within business schools. The number of respondents to this year's Survey was nearly identical to the 1985 Survey (128 vs 125), representing about half of the AACSB-accredited business schools in the U.S. and Canada. Although some schools participated in this year's Survey for the first time and others dropped out, the overall demographic profiles of the two samples are quite similar, allowing meaningful comparisons to be made.

In many ways the single most critical element in the computerization effort is the level of ongoing financial support for operations. This support translates into personnel, maintenance, software and courseware acquisition and development, and supplies. These are the operational elements which make the utilization of the equipment successful. About two-thirds of the schools reported that their operating funds for computing were from school or university resources. The overall median expenditure-per-student between 1985 and 1987 changed only $5, from $93 to $98. However, the discrepancy between the schools in the first and fourth quartiles has grown from a ratio of 25 in 1985 to 45 in 1987. While the median of the top quartile grew by $53 per student ($497 vs $444), the median of the

bottom quartile actually shrank by $7 ($11 vs $18). As was pointed out earlier, these findings should be approached with caution, for the budget data across schools may not be totally comparable. Nevertheless, the magnitude of the difference between the quartiles *is* significant.

Computer support staff is an important area of funding allocation. The analysis showed that staff support increased for all quartiles. Almost every school was investing in the human capital so necessary to the successful use of computing. The data also showed a shift away from technical support toward user support, reflecting the growth in the areas of installation and operation of microcomputers, training, and courseware development.

In the area of microcomputer equipment, not surprisingly, IBM dominates the desktop market, with nearly 90% of the schools reporting at least some IBM micros (PCs, XTs, and ATs) on site. In terms of absolute numbers, this represents over 50% of the total number of micros installed. On a five-point endorsement scale, four desktop micros received a rating of 4.0 or better. In order, they were Apple Macintosh (4.3), HP Vectra (4.2), IBM PC/AT (4.2), and IBM PC/AT (4.1). The ratings for the portables were somewhat lower on average, with only the Zenith laptop receiving a 4.0 rating. This suggests that the vendors have additional work in the technical development of laptops in order to equal the success they have had with their desktop models.

The data showed that both the student and the faculty microcomputer densities greatly improved, the student density by an average of 50% and the faculty by an average of 64%. A major issue is appropriate micro-densities, especially for students. (One would assume a one-to-one ratio for faculty is optimal). An associated question concerns student ownership. There was no change between 1985 and 1987 with respect to the number of schools requiring student ownership. Will this continue? What will be a school's responsibility for providing access to computers?

Although many of the micros are standalones, an increasing number are now beginning to be directly connected by local area networks (LANs). This growth has been quite dramatic, with nearly two-thirds of the schools now having at least one LAN in place. Ethernet is the most commonly used, with a 40% penetration and an endorsement rating of 3.7; Novell is second with 26% of the market and a 4.4 rating. For wide area networks (WANs), BITNET is the overwhelming choice, with about 59% of the schools participating in this Survey providing this service.

In terms of school-based minicomputers, growth has occurred here as well, with a 36% increase in the number of autonomous systems reported since 1985. However, Digital and IBM, first and second respectively, grew at about twice this rate, with the VAX 11/7xx series continuing to be the most popular single choice.

The actual use of all this equipment to support the instructional programs of the business schools, both undergraduate and graduate, has shown somewhat less dramatic growth, 8.2% and 3.3% respectively, perhaps because the level was already fairly high. In the ten courses that comprise the AACSB academic core, a substantial percentage of the schools have required computer usage in some or all sections. However, what is not clear from the data is the nature of this required use. Is it modest or extensive? Is it central to the learning objective of the course or peripheral? Is it used for analysis or merely for illustration?

In summary, as the computer has become a necessity in the business community, computer support has become an essential component in the business schools. Central to this,

of course, is the microcomputer which has made computing power economically and technically feasible to most schools. The explosive growth of microcomputers raises several questions: Will the growth in sheer numbers of micros yet again double in two years? Can funds and staff support the growth? Is there space to put this amount of equipment? As newer systems are introduced, e.g. the IBM PS/2 series, will these replace older systems? How will schools deal with technical obsolescence and upgrading of systems? Will the flexibility of portables warrant their expanded use?

There are several other questions which this Survey did not address: What are appropriate spending levels? What should be budget priorities? Who should pay for computing? Should student computing fee be more broadly initiated? What is the impact of the vast difference in spending levels between schools? Can a school remain competitive in attracting outstanding faculty and students if the computing resources are substantially less that those of comparable schools? Questions along this line will be a focus of future surveys.

This Survey, as was true of the previous three UCLA Surveys of Business School Computer Usage, has focused on what *currently exists* and has not addressed the issue of what *should exist*. The reader is cautioned not to interpret "what is" as "what should be." Furthermore, data related to goals, processes, and benefits has not been gathered and will be left for a future survey.

FOURTH ANNUAL UCLA SURVEY: 1987
GENERAL SCHOOL DATA

INSTITUTION	TYPE	UGRAD (FTE)	MBA (FTE)	PHD (FTE)	FAC (FTE)	COMPUTER BUDGET	COMP BDGT/ STUDENT($)	COMP/TOT BUDGET(%)	FACILITIES	STUD/COMP STAFF	COMPUTER FEE ($)
U OF AKRON	PUB	1735	.	.	101	.	.	.	UNIV ONLY	.	
U OF ARIZONA	PUB	5350	364	112	140	2900000	498	.	BOTH	233	
ARIZONA ST U	PUB	9000	650	120	190	.	.	.	UNIV ONLY	.	
U OF ARKANSAS, FAYETTEVILLE	PUB	4566	255	70	76	220000	45	5.3	BOTH	.	
U OF ARKANSAS, LITTLE ROCK	PUB	1150	80	.	51	20000	16	1.0	UNIV ONLY	.	
AUBURN U	PUB	3300	55	.	114	.	.	.	UNIV ONLY	.	YES
BABSON COL	PUB	1551	925	.	121	1100000	444	4.5	UNIV ONLY	.	
BOSTON COL	PRIV	2200	375	.	.	.	.	.	UNIV ONLY	1288	
BOSTON U	PRIV	1700	900	30	120	300000	114	5.0	BOTH	164	
BRADLEY U	PRIV	794	56	.	41	15000	18	0.9	UNIV ONLY	.	
U OF CAL, BERKELEY	PUB	558	483	95	86	520000	458	4.3	BOTH	189	
U OF CAL, IRVINE	PUB	.	331	35	38	202000	552	4.8	BOTH	.	
U OF CAL, L A (ANDERSON)	PUB	.	900	150	96	1000000	952	6.7	BOTH	50	
CAL ST U, FULLERTON	PUB	6551	545	.	124	.	.	.	UNIV ONLY	788	
CAL ST U, HAYWARD	PUB	3880	401	.	106	98000	23	.	UNIV ONLY	612	
CAL ST U, LONG BEACH	PUB	4684	424	.	91	42000	.	.	UNIV ONLY	.	
CAL ST U, LOS ANGELES	PUB	2470	177	.	123	4100	2	0.0	UNIV ONLY	.	
CAL ST U, FRESNO	PUB	3368	234	.	109	.	.	.	BOTH	360	
CANISIUS COL	PRIV	1717	.	.	48	38000	22	0.2	UNIV ONLY	.	35/COURSE
CASE WESTERN U (WEATHERHEAD)	PRIV	200	689	73	62	300000	312	2.7	UNIV ONLY	120	
U OF CENTRAL FLORIDA	PUB	2590	298	.	122	.	.	.	UNIV ONLY	.	
U OF CINCINNATI	PUB	2610	287	61	77	200250	.	.	BOTH	370	
CLEVELAND ST U (NANCE)	PUB	1600	480	.	97	257000	124	3.8	BOTH	.	
U OF COLORADO, DENVER	PUB	850	650	.	83	.		.	UNIV ONLY	.	
COLUMBIA U	PRIV	.	1300	100	112	498000	[illegible]	1.5	BOTH	.	200/YEAR
CORNELL U (JOHNSON)	PRIV	.	505	40	47	500000	[illegible]	4.2	BOTH	.	

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FOURTH ANNUAL UCLA SURVEY: 1987
GENERAL SCHOOL DATA

INSTITUTION	TYPE	UGRAD (FTE)	MBA (FTE)	PHD (FTE)	FAC (FTE)	COMPUTER BUDGET	COMP BDGT/ STUDENT($)	COMP/TOT BUDGET(%)	FACILITIES	STUD/COMP STAFF	COMPUTER FEE ($)
CREIGHTON U	PRIV	780	137	.	39	10000	11	0.2	UNIV ONLY	.	
DARTMOUTH COL (TUCK)	PRIV	.	330	.	35	.	.	.	UNIV ONLY	.	
U OF DAYTON	PRIV	1465	366	.	64	.	.	.	UNIV ONLY	203	52/YEAR
U OF DELAWARE	PUB	2020	170	.	95	350000	160	7.3	UNIV ONLY	.	
U OF DENVER	PRIV	.	.	.	.	100000	.	2.3	UNIV ONLY	0	
DREXEL U	PRIV	2852	1384	48	118	.	.	.		.	
DUKE U (FUQUA)	PRIV	.	596	20	52	.	.	.	BOTH	.	
DUQUESNE U	PRIV	950	.	.	53	60000	63	3.5	UNIV ONLY	.	
EAST TEXAS ST U	PUB	568	50	.	39	.	.	.	UNIV ONLY	.	
EASTERN WASHINGTON U	PUB	1325	250	.	47	.	.	.		.	15/COURSE
FLORIDA INTERNATIONAL U	PUB	1856	362	.	95	100000	45	1.7	UNIV ONLY	.	
FLORIDA ST U	PUB	2688	221	53	115	173000	58	2.9	UNIV ONLY	.	
FORT LEWIS COL	PUB	967	.	.	25	.	.	.	UNIV ONLY	.	
GEORGIA ST U	PUB	4223	1585	154	211	2845000	477	19.0	BOTH	136	
HARVARD U	PRIV	.	1500	100	180	3800000	2375	3.5	BOTH	.	
U OF HAWAII	PUB	920	226	.	80	250000	218	6.3	BOTH	72	15/YEAR
HOFSTRA U	PRIV	3747	863	.	130	.	.	.	UNIV ONLY	.	
HOWARD U	PRIV	2150	138	.	70	150000	66	5.0	BSCH ONLY	.	
U OF ILLINOIS, CHICAGO	PUB	2369	399	18	98	27000	10	0.4	UNIV ONLY	.	
INDIANA U, BLOOMINGTON	PUB	2445	695	134	144	.	.	.	BOTH	.	
INDIANA U, GARY	PUB	341	93	.	28	.	.	.	UNIV ONLY	.	
U OF IOWA	PUB	1900	430	150	123	576120	232	7.8	BOTH	.	
U OF KANSAS	PUB	1000	400	50	55	30000	21	.	UNIV ONLY	1450	
KANSAS ST U	PUB	2616	141	.	46	83750	30	3.3	UNIV ONLY	.	
U OF KENTUCKY	PUB	2643	216	50	111	100000	34	3.6	UNIV ONLY	.	
U OF LOUISVILLE	PUB	770	120	.	67	.	.	.	UNIV ONLY	.	

FOURTH ANNUAL UCLA SURVEY: 1987
GENERAL SCHOOL DATA

INSTITUTION	TYPE	UGRAD (FTE)	MBA (FTE)	PHD (FTE)	FAC (FTE)	COMPUTER BUDGET	COMP BDGT/ STUDENT($)	COMP/TOT BUDGET(%)	FACILITIES	STUD/COMP STAFF	COMPUTER FEE ($)
LOYOLA MARYMOUNT U	PRIV	1100	310	.	45	30000	21	.	UNIV ONLY	.	
LOYOLA U, NEW ORLEANS	PRIV	480	240	.	38	2000	3	.	UNIV ONLY	.	
U OF MAINE, ORONO	PUB	982	65	.	21	7500	7	0.7	UNIV ONLY	.	20/COURSE
U OF MARYLAND	PUB	1800	460	60	75	180000	78	18.0	BSCH ONLY	.	
MIT (SLOAN)	PRIV	101	416	84	77	850000	1414	4.5	BSCH ONLY	.	
MIAMI U	PUB	5100	110	.	150	80000	15	2.7	UNIV ONLY	.	
U OF MICHIGAN, ANN ARBOR	PUB	631	1182	92	118	1000000	525	3.7	UNIV ONLY	56	300/YEAR
U OF MICHIGAN, FLINT	PUB	450	.	.	30	.	.	.	UNIV ONLY	.	
MIDDLE TENNESSEE ST U	PUB	2577	92	.	85	30000	11	0.7	UNIV ONLY	.	
U OF MINNESOTA (CARLSON)	PUB	1552	1055	130	89	120000	44	0.8	BOTH	547	60/YEAR
U OF MISSOURI, COLUMBIA	PUB	1100	270	40	60	258663	183	3.8	UNIV ONLY	201	
U OF MONTANA	PUB	1650	85	.	39	40000	23	.	UNIV ONLY	1735	YES
NEW YORK U	PRIV	2300	2337	65	260	1545000	329	3.9	UNIV ONLY	174	150/YEAR
U OF NO CAROLINA, CHARLOTTE	PUB	2063	123	.	74	40000	18	1.2	UNIV ONLY	.	30/YEAR
U OF NO CAROLINA, GREENSBORO	PUB	2007	281	.	76	221070	97	6.4	UNIV ONLY	.	14/COURSE
U OF NORTH DAKOTA	PUB	1400	30	.	61	71000	50	2.6	UNIV ONLY	.	
NORTH TEXAS STATE U	PUB	5077	680	125	140	.	.	.	UNIV ONLY	.	16/COURSE
NORTHERN ARIZONA U	PUB	1700	85	.	59	30000	17	2.0	UNIV ONLY	.	
NORTHWESTERN U (KELLOGG)	PRIV	.	1450	100	133	600000	387	.	BOTH	.	
U OF NOTRE DAME	PRIV	1626	312	.	97	.	.	.	UNIV ONLY	969	
OHIO ST U	PUB	3456	501	186	120	.	.	.	BSCH ONLY	259	
OKLAHOMA ST U	PUB	3977	361	63	103	295000	67	4.6		880	25/COURSE
U OF OREGON	PUB	2500	214	50	56	90000	33	3.9	BOTH	395	60/YEAR
OREGON ST U	PUB	2638	139	.	68	18500	7	0.8	BOTH	.	60/YEAR
U OF THE PACIFIC	PRIV	572	.	.	23	.	.	.	UNIV ONLY	.	
PACIFIC LUTHERAN U	PRIV	426	122	.	21	5000	9	0.4	UNIV ONLY	.	

FOURTH ANNUAL UCLA SURVEY: 1987
GENERAL SCHOOL DATA

INSTITUTION	TYPE	UGRAD (FTE)	MBA (FTE)	PHD (FTE)	FAC (FTE)	COMPUTER BUDGET	COMP BDGT/ STUDENT($)	COMP/TOT BUDGET(%)	FACILITIES	STUD/COMP STAFF	COMPUTER FEE ($)
U OF PENNSYLVANIA (WHARTON)	PRIV	2375	1450	400	195	1755000	415	2.5	BOTH	156	200/YEAR
PENNSYLVANIA ST U	PUB	5288	321	145	127	95000	17	0.7	UNIV ONLY	.	
U OF PITTSBURG (KATZ)	PRIV	.	765	75	72	400000	476	4.7	BSCH ONLY	.	45/YEAR
PORTLAND ST U	PUB	2809	209	.	61	35000	12	1.1	UNIV ONLY	.	
PURDUE U (KRANNER)	PUB	2150	360	120	83	240000	91	2.7	BOTH	219	
RENSSELAER POLYTECHNIC INST	PRIV	451	161	25	35	250000	392	14.3	UNIV ONLY	637	
U OF RICHMOND (ROBINS)	PRIV	363	130	.	42	15000	30	0.5	UNIV ONLY	123	
U OF ROCHESTER (SIMON)	PRIV	.	660	58	100	357000	497	4.2	BSCH ONLY	42	
ROLLINS COL (CRUMMER)	PRIV	.	278	.	16	.	.	.	UNIV ONLY	70	
RUTGERS ST U OF NEW JERSEY	PUB	.	1000	75	75	.	.	.		.	
ST CLOUD ST U	PUB	.	.	.	.	185000	.	.	UNIV ONLY	.	
ST JOHN'S U	PRIV	4517	869	.	149	.	.	.	UNIV ONLY	.	60/COURSE
SAN JOSE ST U	PUB	2750	650	.	112	350000	103	3.9	BOTH	.	
U OF SAN FRANCISCO (MCLAREN)	PRIV	1140	340	.	47	.	.	.	UNIV ONLY	.	
U OF SOUTH CAROLINA	PUB	2342	642	308	152	776144	236	7.4	BOTH	118	
U OF SOUTHERN CALIFORNIA	PRIV	3067	710	44	170	500000	131	.	BOTH	.	
SO ILLINOIS U, CARBONDALE	PUB	2489	155	20	61	45000	17	1.2	UNIV ONLY	1332	30/YEAR
U OF SOUTHERN MISSISSIPPI	PUB	2083	110	.	76	50000	23	1.4	UNIV ONLY	.	10/COURSE
STANFORD U	PRIV	.	672	75	90	1000000	1339	5.3	BSCH ONLY	.	90/YEAR
U OF TEXAS, ARLINGTON	PUB	5452	537	28	131	65000	11	1.0	BOTH	1003	10/COURSE
U OF TEXAS AT AUSTIN	PUB	9000	1100	.	140	465656	46	.	BOTH	.	
TEXAS TECH U	PUB	4500	325	70	101	315000	64	6.3		.	
U OF TOLEDO	PUB	3299	242	.	97	16500	5	0.3	UNIV ONLY	1771	
UTAH ST U	PUB	.	145	.	55	75000	517	3.0	UNIV ONLY	29	10/COURSE
VALDOSTA ST COL	PUB	850	43	.	27	50000	56	2.5	UNIV ONLY	149	
VANDERBILT U (OWEN)	PRIV	.	402	10	34	86500	210	1.5	UNIV ONLY	206	

FOURTH ANNUAL UCLA SURVEY: 1987
GENERAL SCHOOL DATA

INSTITUTION	TYPE	UGRAD (FTE)	MBA (FTE)	PHD (FTE)	FAC (FTE)	COMPUTER BUDGET	COMP BDGT/ STUDENT($)	COMP/TOT BUDGET(%)	FACILITIES	STUD/COMP STAFF	COMPUTER FEE ($)
VILLANOVA U	PRIV	2050	245	.	90	.	.	.	UNIV ONLY	765	
U OF VIRGINIA (MCINTIRE)	PUB	620	35	.	48	65000	99	2.2	BOTH	.	
VIRGINIA COMMONWEALTH U	PUB	2606	299	21	139	.	.	.	BOTH	325	
WAKE FOREST U (BUS AND ACCT)	PRIV	413	.	.	16	.	.	.	UNIV ONLY	.	
WAKE FOREST U (BABCOCK)	PRIV	.	320	.	22	90000	281	2.2	BSCH ONLY	160	40/YEAR
U OF WASHINGTON, SEATTLE	PUB	1306	377	49	128	.	.	.	BOTH	192	
WASHINGTON U	PRIV	500	438	30	50	450000	465	3.7	BOTH	.	
WASHINGTON ST U	PUB	1418	159	.	88	108200	69	1.9	BOTH	.	13/COURSE
WEST GEORGIA COL	PUB	2000	16	.	29	.	.	.	UNIV ONLY	.	
WESTERN CAROLINA U	PUB	1030	84	.	44	80356	72	3.1		371	
WESTERN ILLINOIS U	PUB	2947	172	.	85	50000	16	1.3	UNIV ONLY	.	60/YEAR
WESTERN KENTUCKY U	PUB	2200	59	.	68	.	.	.	UNIV ONLY	.	
WESTERN MICHIGAN U	PUB	4098	273	.	97	110000	25	1.8	UNIV ONLY	.	100/YEAR
U OF WISCONSIN, LACROSSE	PUB	2261	92	.	54	.	.	.	UNIV ONLY	.	
U OF WISCONSIN, MADISON	PUB	1142	626	117	84	237800	126	3.6	UNIV ONLY	.	
YALE U	PRIV	.	367	50	50	500000	1199	4.3	BOTH	.	300/YEAR
U OF ALBERTA	PUB	1583	220	19	89	135000	74	1.6	UNIV ONLY	.	
U OF BRITISH COLUMBIA	PUB	1620	460	65	97	35000	.	.	BOTH	238	60/YEAR
DALHOUSIE U	PUB	800	250	.	49	200000	190	11.8	UNIV ONLY	.	
MCGILL U	PRIV	1255	305	22	56	7600	5	.	UNIV ONLY	396	
MCMASTER U	PUB	1343	363	12	60	250000	146	2.5	BOTH	.	
QUEEN'S U, KINGSTON, ONTARIO	PUB	1250	129	35	55	515000	.	.	UNIV ONLY	471	40/YEAR
U OF TORONTO	PUB	1800	515	40	49	270000	115	5.2	BSCH ONLY	.	
U OF WESTERN ONTARIO	PUB	300	500	40	97	300000	.	.	BOTH	.	50/YEAR

FOURTH ANNUAL UCLA SURVEY: 1987
MAINFRAMES/MINICOMPUTERS

INSTITUTION	MAINFRAME MODEL(S), YR(S)	NETWORKED	# TERMS	MF YEAR
	* B-SCHOOL ACCESS ONLY			
U OF AKRON	IBM 3090/200 (1987) IBM4381 (1986) PRIME 850 (1983) VAX 785 (1986) IBM 4361 (1984)	YES		1974
U OF ARIZONA	* VAX 11/750,780,8600 * NCR TOWER XP;32 IBM 4381 VAX 11/780,8600,8700 CDC CYBER 175	YES	77	1974
ARIZONA ST U	IBM 3090 IBM 4281 DEC VAX 8600 IBM 3081 IBM 4381	YES	90	1965
U OF ARKANSAS, FAYETTEVILLE	IBM 4381 MOD 3 * PRIME 9750	YES	53	1966
U OF ARKANSAS, LITTLE ROCK	VAX 1170(4) HONEYWELL 200	YES	2	1974
AUBURN U	IBM 3033 IBM 3083 (1985) VAX 11750		30	
BABSON COL	DEC PDP11/70 (1976) DEC VAX 11/780 (1980) DEC VAX 11/785 (1984)	YES	130	1972
BOSTON COL	IBM 3083 (1985) VAX CLUSTER (4) (1981,86)	YES	50	1978
BOSTON U	IBM 3090 IBM 3090 * WANG VS * WANG OIS/130 * WANG OIS/140	YES	19	1977
BRADLEY U		YES	6	1965

FOURTH ANNUAL UCLA SURVEY: 1987
MAINFRAMES/MINICOMPUTERS

INSTITUTION	MAINFRAME MODEL(S), YR(S)	NETWORKED	# TERMS	MF YEAR
	* B-SCHOOL ACCESS ONLY			
	CDC 830 VAX 780			
U OF CAL, BERKELEY		YES	70	1960
	IBM 7090 * DEC VAX 750 DEC VAX 8600			
U OF CAL, IRVINE		YES	6	1978
	* HP MICRO 3000 XE (1987) HONEYWELL DPS8/49 (1984) DEC 780/785 VMS (1984) IBM 4341 (1985)			
U OF CAL, L A (ANDERSON)		YES	37	1957
	* HP3000/70 (1985) IBM 3090 (1985)			
CAL ST U, FULLERTON		YES	52	1964
	CDC 180/830 (1985) CDC 170/730 (1980) WANG OS 60 PRIME 9750 (1986) PDP 11/44&70 (1981,84)			
CAL ST U, HAYWARD		YES	32	1973
	CDL CYBER 170/720 (1981) CDL CYBER 180 (1986) PRIME 9755 (1986) DEC 11/44 CDL CYBER 170/760 (1981)			
CAL ST U, LONG BEACH		YES	42	1963
	CDC CYBER 760/730 (1979) CDC CYBER 750 (1981) PRIME 9750 (1986) PRIME 9750 (1986)			
CAL ST U, LOS ANGELES		YES	15	
	CYBER 730 CYBER 760 PRIME 9955 PRIME 9755			
CAL ST U, FRESNO			47	1970
	* BURROUGHS A3 (1986) DEC VAX 11/785 (1987) PRIME 9755 (1986) CDC CYBER 720-2 (1980) CDC CYBER 830 (1986)			
CANISIUS COL		YES	24	1969

FOURTH ANNUAL UCLA SURVEY: 1987
MAINFRAMES/MINICOMPUTERS

INSTITUTION	MAINFRAME MODEL(S), YR(S)	NETWORKED	# TERMS	MF YEAR
	• B-SCHOOL ACCESS ONLY			
	DEC VAX 8650 (1987) DEC VAX 750 (1982)			
CASE WESTERN U (WEATHERHEAD)		YES	3	1950
	DEC 2060 IBM 4381 (1987) VAX 11/780			
U OF CENTRAL FLORIDA		YES	10	1970
	IBM 4381 IBM SYS38			
U OF CINCINNATI		YES	76	1968
	AMDAHL 5580,470(1980,84) VAX 785 (1985) • VAX 750 (1987) • AT&T 382 (1987) • MICROVAX II (1987)			
CLEVELAND ST U (NANCE)		YES	8	1970
	IBM 3081 (1986) • VAX 750(2) (1984,1986) • VAX 730(2) (1983,1985)			
U OF COLORADO, DENVER		YES	4	
	PRIME 750 AND 9950 VAX 11/780 PYRAMID 90X SEQUENT B21000 INTEL PSC HYPERCUBE			
COLUMBIA U		YES	10	1980
	• IBM4341 • VAX 11-780 IBM 3083 IBM 4341 DEC 20			
CORNELL U (JOHNSON)		YES	65	1978
	• VAX 785 • VAX 750 • MICROVAXII IBM 4381 IBM 3090			
CREIGHTON U			4	1979
	SPERRY 1100/71 H2			
DARTMOUTH COL (TUCK)		YES	40	
	HONWELLDPS 8/49&52 (1980) DECVAX11/785&750(1982,83) DECVAX11/785&8500(83&87)			

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MAINFRAMES/MINICOMPUTERS

INSTITUTION	MAINFRAME MODEL(S), YR(S)	NETWORKED	# TERMS	MF YEAR
	* B-SCHOOL ACCESS ONLY			
	CONVEX(UNIX) (1987) IBM 4381 VM/CMS (1985)			
U OF DAYTON			25	1962
	VAX 11/780 (2) UNIVAC 90/80			
U OF DELAWARE			31	
	IBM 3081D (1985) VAX/UNIX MULTIPLE DATES IBM4300/BURROUGHS 1			
U OF DENVER		YES	35	1962
	DEC VAX 8300 DEC VAX 785 DEC VAX 750 (4) PYRAMID 90X HARRIS 1000			
DREXEL U			.	
DUKE U (FUQUA)		YES	13	1968
	* IBM 4341 * UNYSIS XE-550 IBM 3083			
DUQUESNE U			31	
	SPERRY 1100/70			
EAST TEXAS ST U		YES	600	1965
	CDC 480 (2 UNITS)			
EASTERN WASHINGTON U			15	
FLORIDA INTERNATIONAL U			.	1985
	DEC VAX 8800 (1986)			
FLORIDA ST U		YES	67	1957
	CDC 170-730 (1979) CDC 170-760 (1981) CDC CYBER 205 (1985) CDC/ETA 10 (1987) IBM3090-400 (1986)			
FORT LEWIS COL		YES	.	1970
	VAX 11/750 DIGITAL (1983) MICROVAXII DIGITAL (1986) MICROVAXII DIGITAL (1986)			
GEORGIA ST U			80	
	UNIVAC 90/80 (2) UNIVAC 1100/92			

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INSTITUTION	MAINFRAME MODEL(S), YR(S)	NETWORKED	# TERMS	MF YEAR
	* B-SCHOOL ACCESS ONLY			
	AMDAHL			
	* IBM 4361			
	* IBM SYSTEM/36 (2)			
HARVARD U		YES	89	1965
	* IBM 4381 (1984)			
	DECSYSTEM 1901 (1979)			
U OF HAWAII			37	1975
	* HP3000 (1981)			
	IBM 3081 (1981)			
	DEC 20 (1980)			
HOFSTRA U		YES	4	1965
	IBM 4381			
	VAX 11/780 (2)			
HOWARD U		YES	62	1970
	* IBM 4331			
	* AT&T 3B15			
U OF ILLINOIS, CHICAGO		YES	170	1965
	IBM 308X VM/CMS			
	CRAY			
INDIANA U, BLOOMINGTON		YES	150	
	CDC 1701855 (1981)			
	* IBM 4381 (1988)			
	PRIME 9955 (3) (1982)			
	VAX 11/785 (6) (1982)			
	VAX 8600 (2) (1986)			
INDIANA U, GARY		YES	5	1971
	PRIME			
	IBM (T&R)			
	DEC			
	VAX			
	IBM (ADM)			
U OF IOWA		YES	80	1970
	IBM 4381 (1986)			
	PRIME 9950 (1980,UPD 86)			
	* BURROUGHS XE550 (1985)			
	* BURROUGHS XE520 (1986)			
	DEC VAX 780 (1985)			
U OF KANSAS		YES	5	
	IBM 3031AP			
	DEC VAX 8600			
KANSAS ST U			17	1967
	NAS 6630 (1984)			

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MAINFRAMES/MINICOMPUTERS

INSTITUTION	MAINFRAME MODEL(S), YR(S)	NETWORKED	# TERMS	MF YEAR
	* B-SCHOOL ACCESS ONLY			
	IBM 4381-1 MVS/SP (1983)			
U OF KENTUCKY			32	
	IBM 3081 (1985) PRIME 950 (1983)			
U OF LOUISVILLE		YES	10	1974
	IBM 3081 (1986) VAX CLUSTER (1986)			
LOYOLA MARYMOUNT U			2	1974
	MAGNUSON M80 MODEL 42 IBM 4341-12 PRIME 2250			
LOYOLA U, NEW ORLEANS			9	1979
	HP3000 SERIES 48 VAX 11/750 IBM 4361			
U OF MAINE, ORONO		YES	3	1968
	IBM 3033/4381			
U OF MARYLAND		YES	30	1981
	* VAX 750			
MIT (SLOAN)		YES	10	1973
	* IBM 4341 (1984) * PRIME 850 (1982)			
MIAMI U		YES	22	1969
	NCR 8570 (1983) IBM 4341 (1982) DEC VAX 750 (1984)			
U OF MICHIGAN, ANN ARBOR		YES	.	1970
	IBM 3090-400 (MTS) AMDAHL 5860 DEC VAX (OCCASIONAL USE)			
U OF MICHIGAN, FLINT		YES	3	1975
MIDDLE TENNESSEE ST U			56	1965
	HONEYWELL DPS8/49D (1984)			
U OF MINNESOTA (CARLSON)			.	
	CYBER * IBM 4341			
U OF MISSOURI, CLOUMBIA		YES	35	1970
	AMDAHL IBM 4381			

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MAINFRAMES/MINICOMPUTERS

INSTITUTION	MAINFRAME MODEL(S), YR(S)	NETWORKED	# TERMS	MF YEAR
	* B-SCHOOL ACCESS ONLY			
U OF MONTANA	VAX 8600		33	1970
NEW YORK U	DECSYSTEM 2060 (1978) DEC VAX 11/780 (1982) DEC 8700 (1987) DEC MICROVAXES (1984)	YES	112	1969
U OF NO CAROLINA, CHARLOTTE	BURROUGHS 6930 (1985) IBM 4381		4	
U OF NO CAROLINA, GREENSBORO	DEC VAX 780 (1979) DEC VAX 780 (1985) DEC VAX (1987)	YES	51	1973
U OF NORTH DAKOTA	IBM 3090/180		38	1971
NORTH TEXAS STATE U	SAS 8083 (ACADEMIC) NAS 8083 (ADMIN) VAX (2)	YES	98	1970
NORTHERN ARIZONA U	IBM 3083 (1985)		18	1965
NORTHWESTERN U (KELLOGG)	* HP 3000/70 (1986) VAX 11-780 * IBM 4341 IBM 4381 CYBER	YES	38	
U OF NOTRE DAME	IBM 3033 (1984)		16	1978
OHIO ST U	* PRIME 9955	YES	273	1981
OKLAHOMA ST U	IBM 3081 K- (1985) DEC VAX 11/780 (1983)		28	1967
U OF OREGON	* HP 3000 4- (1985) DEC 1091 IBM 4341	YES	38	1965

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MAINFRAMES/MINICOMPUTERS

INSTITUTION	MAINFRAME MODEL(S), YR(S)	NETWORKED	# TERMS	MF YEAR
	* B-SCHOOL ACCESS ONLY			
OREGON ST U	* QUANTEL CYBER		17	1962
U OF THE PACIFIC	DEC VAX 11/785 (1985)		1	1977
PACIFIC LUTHERAN U	VAX 750(1983) 785(1980)		6	1979
U OF PENNSYLVANIA (WHARTON)	* DEC VAX 8650 * DEC VAX 11/750 IBM 4381 GX * UNISYS XE550(2) * DEC MICROVAXII (3)	YES	45	1972
PENNSYLVANIA ST U	IBM 3090 (1986) 1 IBM 4381 (2) (1985)	YES	.	
U OF PITTSBURG (KATZ)	* IBM 4381 (1986) AT&T 3B15	YES	37	1965
PORTLAND ST U	IBM 4381 (1986)		.	1965
PURDUE U (KRANNER)	* HP3000/48 (1982) IBM 3083-B (1985) CDC 6000 (1968) CYBER 205 (1984) VAX 785	YES	19	1962
RENSSELAER POLYTECHNIC INST	IBM 3081 K (1985) VARIOUS VAX IBM MINI VARIOUS SUNSYSTEMS SYMBOLICS	YES	6	
U OF RICHMOND (ROBINS)	VAX 750 VAX 785	YES	8	1979
U OF ROCHESTER (SIMON)	* HP 3000 (1982) * IBM 4361 (1985)	YES	35	1965
ROLLINS COL (CRUMMER)	VAX 11/750		12	1982

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MAINFRAMES/MINICOMPUTERS

INSTITUTION	MAINFRAME MODEL(S), YR(S)	NETWORKED	# TERMS	MF YEAR
	* B-SCHOOL ACCESS ONLY			
RUTGERS ST U OF NEW JERSEY				
ST CLOUD ST U		YES	10	1965
	UNIVAC 1100/90			
	VAX 8550			
ST JOHN'S U			10	1970
	HONEYWELL DPS8/49 (1984)			
	HONEYWELL 68/DPS (1981)			
SAN JOSE ST U		YES	57	1984
	CYBER (1983)			
	PRIME (1983)			
	* VAX CLUSTER (1984-5)			
	* HP3000 42 (1983)			
	* HP3000 III (1984)			
U OF SAN FRANCISCO (MCLAREN)			269	1968
	DG MV1000			
	VAX 785			
U OF SOUTH CAROLINA		YES	160	1984
	* IBM 4381 (1984)			
	IBM 3081-D24 (1983)			
	IBM 3081-D24 (1984)			
	DEC VAX 11-780 (1984)			
	* IBM SYSTEM 36			
U OF SOUTHERN CALIFORNIA		YES	45	1968
	IBM 3081 MVS			
	IBM 4341 VM/CMS			
	DEC 20 TOPS			
	* HP3000/44 MPE			
SO ILLINOIS U, CARBONDALE			13	1963
	PRIME 750			
	IBM 3081 GX (2)			
	IBM 4341			
U OF SOUTHERN MISSISSIPPI		YES	35	1968
	HONEYWELL DPS-8			
STANFORD U		YES	80	1968
	* DEC 20 (2)			
U OF TEXAS, ARLINGTON		YES	140	
	IBM 4381 (2) (1983,85)			
	DEC 2060 (1978)			
	VAX 11-750 (1984)			
	CRAY (1986)			
	* WANG VS-20 (1986)			

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MAINFRAMES/MINICOMPUTERS

INSTITUTION	MAINFRAME MODEL(S), YR(S)	NETWORKED	# TERMS	MF YEAR
	* B-SCHOOL ACCESS ONLY			
U OF TEXAS AT AUSTIN	IBM 3081D CYBER 750 CRAY-1 DEC-20 * VAX 11/780	YES	235	1966
TEXAS TECH U		YES	92	1968
U OF TOLEDO	NAS 9080 VAX780		70	1960
UTAH ST U	VAX 8650 IBM 4381		27	1968
VALDOSTA ST COL	CYBER 850 (1980) IBM 4381 (1980) PRIME 750 (1984)		26	1982
VANDERBILT U (OWEN)	VAX 8800 (2)	YES	15	1969
VILLANOVA U	IBM 4381 VAX 11-780 (2) MICROVAX	YES	4	1970
U OF VIRGINIA (MCINTIRE)	CDC 180/855,170/815 PRIME 750 IBM * AT&T 382	YES	18	1970
VIRGINIA COMMONWEALTH U	IBM 3081-D * PYRAMID 90-X * NBI SYSTEM 64	YES	130	1967
WAKE FOREST U (BUS AND ACCT)	PRIME 750		.	1978
WAKE FOREST U (BABCOCK)	* WANG OIS		.	1980
U OF WASHINGTON, SEATTLE	* HP3000/42XP (1986) * DEC VAX 11/780 (1980) CDC CYBER 180/845 (1087)	YES	69	

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MAINFRAMES/MINICOMPUTERS

INSTITUTION	MAINFRAME MODEL(S), YR(S)	NETWORKED	# TERMS	MF YEAR
	* B-SCHOOL ACCESS ONLY			
WASHINGTON U	IBM 43XX (4) * VAX 8600 * VAX 780	YES	50	1960
WASHINGTON ST U	IBM 3090-200 * NCR		85	1950
WEST GEORGIA COL	OMEGA		.	1972
WESTERN CAROLINA U	DIGITAL CAV 11/780 (1982) 4		32	1965
WESTERN ILLINOIS U	IBM 4381 (1984) IBM 4341 (1987) DEC PDP 11/44 (1982) DEC MICROVAX II (1986) CDC CYBER 170/730 (1979)		100	1968
WESTERN KENTUCKY U	IBM 4341-2 (1981) DEC VAX 750 (1983) DEC PDP 11/44		51	
WESTERN MICHIGAN U	DECSYSTEM 1099 VAX SUPERMINI CLUSTER IBM 4341		32	1959
U OF WISCONSIN, LACROSSE	VAX 11/780 HP2000	YES	2	
U OF WISCONSIN, MADISON	UNIVAC 1100 DEC VAX 780 DEC VAX 8200 IBM 4381	YES	5	1968
YALE U	IBM 3083 (1985) AMDAHL V8 DEC VAX 8600 (1986) * DEC VAX 750	YES	6	1978
U OF ALBERTA	AMDAHL 6880 (1985)	YES	35	1965

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INSTITUTION	MAINFRAME MODEL(S), YR(S)	NETWORKED	# TERMS	MF YEAR
	* B-SCHOOL ACCESS ONLY			
	IBM 3881 (1985)			
U OF BRITISH COLUMBIA		YES	30	1962
	AMDAHL MAIN			
	* DG MV10000			
DALHOUSIE U		YES	32	1976
	MICROVAX (2) (1986)			
	MICROVAX (1986)			
	DEC 8800 (1987)			
	VAX 750,785 (1983)			
MCGILL U			60	1968
	AMDAHL 5850			
	IBM 4381-R14			
MCMASTER U			24	1972
	* VAX 8600 (1985)			
	IBM 4831 (1984)			
QUEEN'S U, KINGSTON, ONTARIO		YES	92	1966
	IBM 3081 H (UPD 1984,86)			
	IBM 4341 (UPD 1981)			
U OF TORONTO			63	1985
	* DG MV8000 II <91985)			
U OF WESTERN ONTARIO		YES	95	1964
	* IBM 4381 (1986)			
	CYBER (1978)			

FOURTH ANNUAL UCLA SURVEY: 1987
MICROCOMPUTERS

INSTITUTION	#	MICROCOMPUTERS (N>3)	TOTAL MICROS	STUDS/ MICRO	FAC/ MICRO	MICRO YEAR	LINKAGE WITH COMMUNICATIONS		& %
U OF AKRON			147	17	3.6	1983		MICROS	70
	119	IBM PC/XT							
	28	ITT							
U OF ARIZONA			385	26	1.1	1976	HOST	MICROS	58
	5	DEC RAINBOW							
	68	IBM PC/XT							
	30	IBM PC/AT							
	103	PC COMPATIBLES							
	11	ZENITH							
	124	DMV							
	40	DIGITAL PRO 350							
ARIZONA ST U			605	28	0.7	1983			0
	550	IBM PC/XT							
	25	IBM PC/AT							
	30	ZENITH							
U OF ARKANSAS, FAYETTEVILLE			83	61	0.0	1980	HOST		53
	10	IBM PC/XT							
	30	IBM PC/AT							
	43	PC COMPATIBLES							
U OF ARKANSAS, LITTLE ROCK			44	0	1.2				0
	4	TANDY							
	40	ZENITH							
AUBURN U			70	0	1.9				0
	50	IBM PC/XT							
	5	IBM PC/AT							
	15	AT&T							
BABSON COL			276	28	1.6	1981	HOST		72
	180	DEC RAINBOW							
	90	IBM PC/XT							
	5	PC COMPATIBLES							
BOSTON COL			93	143	.		HOST	MICROS	81
	90	APPLE MACINTOSH							
BOSTON U			197	30	1.3	1982	HOST	MICROS	62
	180	IBM PC/XT							
	6	IBM PC/AT							
	6	WANG PC							
BRADLEY U			51	30	3.2	1982	HOST	MICROS	51
	5	IBM PC/XT							
	42	6300							
U OF CAL, BERKELEY			129	14	2.6	1981	HOST		3
	25	APPLE MACINTOSH							

FOURTH ANNUAL UCLA SURVEY: 1987
MICROCOMPUTERS

INSTITUTION	#	MICROCOMPUTERS (N>3)	TOTAL MICROS	STUDS/ MICRO	FAC/ MICRO	MICRO YEAR	LINKAGE WITH & COMMUNICATIONS		%
	33	IBM PC/XT							
	71	IBM PC/AT							
U OF CAL, IRVINE			86	8	1.5	1981	HOST		49
	64	HP VECTRA							
	21	IBM PC/XT							
U OF CAL, L A (ANDERSON)			275	8	0.9	1984	HOST		73
	70	HP VECTRA							
	65	HP, OTHER MODELS							
	5	IBM PC/XT							
	135	IBM PC/AT							
CAL ST U, FULLERTON			197	70	1.3	1978	HOST		53
	4	APPLE MACINTOSH							
	11	APPLE II SERIES							
	67	IBM PC/XT							
	106	PC COMPATIBLES							
	9	WANG							
CAL ST U, HAYWARD			67	113	11.8	1982	HOST		25
	41	IBM PC/XT							
	19	AT&T							
	7	COMPAQ							
CAL ST U, LONG BEACH			157	51	2.7			MICROS	99
	153	IBM PC/XT							
CAL ST U, LOS ANGELES			79	36	41.0	1985	HOST	MICROS	33
	41	IBM PC/XT							
	37	PC COMPATIBLES							
CAL ST U, FRESNO			63	69	54.5	1984	HOST		70
	55	PC COMPATIBLES							
	7	UNISYS							
CANISIUS COL			58	57	2.0	1977	HOST		99
	3	APPLE II SERIES							
	47	IBM PC/XT							
	7	ZENITH							
CASE WESTERN U (WEATHERHEAD)			112	20	1.5	1982	HOST	MICROS	46
	55	IBM PC/XT							
	47	IBM PC/AT							
	10	PC COMPATIBLES							
U OF CENTRAL FLORIDA			158	58	1.5	1978	HOST		3
	5	APPLE II SERIES							
	150	IBM PC/XT							
U OF CINCINNATI			132	67	1.1	1981	HOST	MICROS	33
	50	IBM PC/XT							

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MICROCOMPUTERS

INSTITUTION	#	MICROCOMPUTERS (N>3)	TOTAL MICROS	STUDS/ MICRO	FAC/ MICRO	MICRO YEAR	LINKAGE WITH COMMUNICATIONS		& %
	79	ZENITH							
CLEVELAND ST U (NANCE)			249	11	1.9	1981	HOST	MICROS	20
	23	IBM PC/XT							
	6	IBM PC/AT							
	220	PC COMPATIBLES							
U OF COLORADO, DENVER			33	0	3.0		HOST		36
	10	IBM PC/XT							
	20	ZENITH							
COLUMBIA U			161	13	4.9	1984	HOST		59
	155	IBM PC/XT							
	6	IBM PC/AT							
CORNELL U (JOHNSON)			106	10	1.7	1983	HOST		99
	33	APPLE MACINTOSH							
	20	DEC RAINBOW							
	14	HP VECTRA							
	27	IBM PC/XT							
	12	PC COMPATIBLES							
CREIGHTON U			37	30	13.0	1985	HOST		46
	37	PC COMPATIBLES							
DARTMOUTH COL (TUCK)			112	5	1.3	1983	HOST		100
	45	APPLE MACINTOSH							
	65	IBM PC/XT							
U OF DAYTON			41	76	7.1	1983	HOST		95
	39	NCR DMI							
U OF DELAWARE			94	55	3.4	1981	HOST		37
	84	IBM PC/XT							
	8	PC COMPATIBLES							
U OF DENVER			212	0	.	1980	HOST	MICROS	42
	6	APPLE II SERIES							
	75	IBM PC/XT							
	20	IBM PC/AT							
	20	PC COMPATIBLES							
	90	ZENITH							
DREXEL U			109	428	1.3	1982			0
	102	APPLE MACINTOSH							
	5	IBM PC/XT							
DUKE U (FUQUA)			172	9	1.2	1980	HOST	MICROS	99
	121	IBM PC/XT							
	10	IBM PC/AT							
	27	UNISYS							
	12	ZENITH							

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MICROCOMPUTERS

INSTITUTION	#	MICROCOMPUTERS (N>3)	TOTAL MICROS	STUDS/ MICRO	FAC/ MICRO	MICRO YEAR	LINKAGE WITH COMMUNICATIONS		& %
DUQUESNE U	78	IBM PC/XT	79	19	2.3	1985			0
EAST TEXAS ST U	46	IBM PC/XT	53	15	7.8	1986	HOST		11
	7	COMPAQ							
EASTERN WASHINGTON U	18	HP, OTHER MODELS	64	40	2.3	1984	HOST	MICROS	31
	34	IBM PC/XT							
	11	AT&T							
FLORIDA INTERNATIONAL U	42	IBM PC/XT	112	96	1.2	1985		MICROS	21.
	67	ZENITH							
FLORIDA ST U	55	IBM PC/XT	136	39	3.6	1984	HOST		66
	78	ZENITH							
FORT LEWIS COL	16	XEROX	20	48	0.0	1983	HOST		15
GEORGIA ST U	6	APPLE MACINTOSH	470	46	0.9	1982	HOST	MICROS	57
	400	IBM PC/XT							
	62	IBM PC/AT							
HARVARD U	150	IBM PC/XT	150	0	0.0	1982	HOST	MICROS	97
U OF HAWAII	46	IBM PC/XT	113	17	3.5	1983	HOST	MICROS	37
	65	PC COMPATIBLES							
HOFSTRA U	32	IBM PC/XT	34	0	4.2	1982			0
HOWARD U	10	HP, OTHER MODELS	74	38	6.4	1984	HOST		35
	11	IBM PC/XT							
	27	IBM PC/AT							
	26	AT&T UNIX							
U OF ILLINOIS, CHICAGO	4	IBM PC/XT	66	100	4.7	1983		MICROS	86
	61	PC COMPATIBLES							
INDIANA U, BLOOMINGTON	275	IBM PC/XT	296	65	0.7		HOST		68
	20	IBM PC/AT							

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MICROCOMPUTERS

INSTITUTION	#	MICROCOMPUTERS (N>3)	TOTAL MICROS	STUDS/ MICRO	FAC/ MICRO	MICRO YEAR	LINKAGE WITH COMMUNICATIONS		& %
INDIANA U, GARY	8	IBM PC/XT	8	0	7.0	1985	HOST		13
U OF IOWA	21	APPLE MACINTOSH	193	31	1.5	1980	HOST	MICROS	99
	5	HP VECTRA							
	65	IBM PC/XT							
	10	IBM PC/AT							
	61	UNISYS							
	31	LEADING EDGE							
U OF KANSAS	4	APPLE MACINTOSH	69	58	1.4	1981	HOST		35
	15	ZENITH							
	50	AT&T							
KANSAS ST U	15	IBM PC/XT	111	41	1.6	1983	HOST		15
	96	ZENITH							
U OF KENTUCKY	120	IBM PC/XT	120	58	1.6	1985	HOST		4
U OF LOUISVILLE	29	ITT	29	99	3.3		HOST		99
LOYOLA MARYMOUNT U	26	IBM PC/XT	32	67	5.6	1982	HOST		6
	4	FORTUNE 32:16							
LOYOLA U, NEW ORLEANS	10	PC COMPATIBLES	11	120	12.7	1984			0
U OF MAINE, ORONO	39	IBM PC/XT	42	58	0.9	1982	HOST		26
U OF MARYLAND	35	IBM PC/XT	62	58	6.3	1983		MICROS	81
	25	IBM PC/AT							
MIT (SLOAN)	30	APPLE MACINTOSH	257	10	0.5	1978	HOST	MICROS	97
	163	IBM PC/XT							
	36	IBM PC/AT							
	25	XEROX WORKSTATIONS							
MIAMI U	130	IBM PC/XT	168	85	1.5		HOST	MICROS	32
	4	IBM PC/AT							
	30	PC COMPATIBLES							

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MICROCOMPUTERS

INSTITUTION	#	MICROCOMPUTERS (N>3)	TOTAL MICROS	STUDS/ MICRO	FAC/ MICRO	MICRO YEAR	LINKAGE WITH COMMUNICATIONS		& %
U OF MICHIGAN, ANN ARBOR			458	11	0.8	1983		MICROS	99
	50	APPLE MACINTOSH							
	6	IBM PC/XT							
	400	UNISYS							
U OF MICHIGAN, FLINT			11	90	30.0	1983	HOST	MICROS	91
	4	IBM PC/XT							
	5	WANG							
MIDDLE TENNESSEE ST U			80	44	4.3	1977	HOST		15
	80	ZENITH							
U OF MINNESOTA (CARLSON)			165	0	0.7	1981	HOST	MICROS	48
	12	APPLE MACINTOSH							
	20	IBM PC/XT							
	30	IBM PC/AT							
	60	PC COMPATIBLES							
	40	ZENITH							
U OF MISSOURI, CLOUMBIA			50	0	1.2	1985	HOST		8
	50	IBM PC/XT							
U OF MONTANA			38	0	1.2	1982	HOST		26
	15	IBM PC/XT							
	15	PC COMPATIBLES							
	7	ZENITH							
NEW YORK U			648	14	1.3	1982	HOST	MICROS	57
	12	APPLE MACINTOSH							
	267	IBM PC/XT							
	9	IBM PC/AT							
	316	ZENITH							
	44	PANASONIC							
U OF NO CAROLINA, CHARLOTTE			63	36	24.7	1983	HOST		2
	63	IBM PC/XT							
U OF NO CAROLINA, GREENSBORO			129	34	1.4	1983	HOST	MICROS	60
	27	IBM PC/XT							
	80	PC COMPATIBLES							
	20	MORROW							
U OF NORTH DAKOTA			97	35	1.3	1979			0
	63	IBM PC/XT							
	10	PC COMPATIBLES							
	24	ZENITH							
NORTH TEXAS STATE U			314	41	1.2	1981	HOST	MICROS	41
	244	PC COMPATIBLES							
	70	TI-PC							
NORTHERN ARIZONA U			118	31	1.2	1982			0

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INSTITUTION	#	MICROCOMPUTERS (N>3)	TOTAL MICROS	STUDS/ MICRO	FAC/ MICRO	MICRO YEAR	LINKAGE WITH COMMUNICATIONS		%
	44	IBM PC/XT							
	69	PC COMPATIBLES							
	5	ZENITH							
NORTHWESTERN U (KELLOGG)			253	22	0.9	1983	HOST	MICROS	55
	23	HP VECTRA							
	230	ZENITH							
U OF NOTRE DAME			74	47	4.6	1982	HOST		19
	24	APPLE MACINTOSH							
	13	APPLE II SERIES							
	37	IBM PC/XT							
OHIO ST U			110	518	1.3		HOST		86.
	7	APPLE MACINTOSH							
	53	IBM PC/XT							
	8	IBM PC/AT							
	7	PC COMPATIBLES							
	7	NCR PC6							
	24	NCR PC8							
OKLAHOMA ST U			203	53	1.0			MICROS	2
	6	APPLE MACINTOSH							
	32	APPLE II SERIES							
	138	IBM PC/XT							
	23	PC COMPATIBLES							
U OF OREGON			83	61	2.3	1980	HOST	MICROS	100
	24	APPLE MACINTOSH							
	18	HP VECTRA							
	23	HP, OTHER MODELS							
	11	IBM PC/XT							
	7	PC COMPATIBLES							
OREGON ST U			218	34	0.6	1978		MICROS	93
	22	HP VECTRA							
	11	HP, OTHER MODELS							
	24	IBM PC/XT							
	154	LEADING EDGE							
	6	AST 286							
U OF THE PACIFIC			16	143	4.6	1982	HOST		31
	5	IBM PC/XT							
	4	PC COMPATIBLES							
	4	BURROUGHS B25							
PACIFIC LUTHERAN U			10	0	4.2	1984	HOST		30
	6	IBM PC/XT							
U OF PENNSYLVANIA (WHARTON)			621	18	0.9	1982	HOST	MICROS	59
	35	APPLE MACINTOSH							
	300	DEC RAINBOW							

INSTITUTION	#	MICROCOMPUTERS (N>3)	TOTAL MICROS	STUDS/ MICRO	FAC/ MICRO	MICRO YEAR	LINKAGE WITH & COMMUNICATIONS		%
	45	HP VECTRA							
	20	HP, OTHER MODELS							
	100	IBM PC/XT							
	62	IBM PC/AT							
	10	PC COMPATIBLES							
	10	TANDY							
	25	UNISYS							
	10	APPOLO							
PENNSYLVANIA ST U			253	47	1.2	1984	HOST		59
	123	IBM PC/XT							
	44	IBM PC/AT							
	45	PC COMPATIBLES							
	41	IBM MODEL-30							
U OF PITTSBURG (KATZ)			120	28	1.1	1978	HOST	MICROS	100
	100	IBM PC/XT							
	20	PC COMPATIBLES							
PORTLAND ST U			78	67	2.2		HOST	MICROS	26
	50	IBM PC/XT							
	25	PC COMPATIBLES							
PURDUE U (KRANNER)			218	28	0.9		HOST	MICROS	99
	56	APPLE MACINTOSH							
	71	HP VECTRA							
	50	HP, OTHER MODELS							
	12	IBM PC/XT							
	27	IBM PC/AT							
RENSSELAER POLYTECHNIC INST			58	34	1.1	1982	HOST		48
	26	IBM PC/XT							
	31	IBM PC/AT							
U OF RICHMOND (ROBINS)			45	21	2.8		HOST		22
	14	IBM PC/XT							
	31	PC COMPATIBLES							
U OF ROCHESTER (SIMON)			105	16	2.4	1980	HOST	MICROS	65
	45	APPLE MACINTOSH							
	10	HP VECTRA							
	25	IBM PC/XT							
	23	IBM PC/AT							
ROLLINS COL (CRUMMER)			47	19	0.9	1982			0
	4	IBM PC/XT							
	39	AT&T 6300							
	4	INSYSTEC							
RUTGERS ST U OF NEW JERSEY			110	27	1.5				0
	30	IBM PC/XT							
	80	ZENITH							

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INSTITUTION	#	MICROCOMPUTERS (N>3)	TOTAL MICROS	STUDS/ MICRO	FAC/ MICRO	MICRO YEAR	LINKAGE WITH COMMUNICATIONS	& %
ST CLOUD ST U			142	0	.	1977	HOST	32
	5	APPLE II SERIES						
	120	IBM PC/XT						
	13	IBM PC/AT						
	4	ZENITH						
ST JOHN'S U			13	0	12.4	1984	HOST	15
	10	IBM PC/XT						
SAN JOSE ST U			186	40	1.4	1982	HOST	54
	37	DEC RAINBOW						
	22	HP, OTHER MODELS						
	45	PC COMPATIBLES						
	82	PC/AT COMP						
U OF SAN FRANCISCO (MCLAREN)			46	37	23.5	1983	HOST MICROS	15
	5	APPLE MACINTOSH						
	6	APPLE II SERIES						
	6	HP, OTHER MODELS						
	22	IBM PC/XT						
	6	PC COMPATIBLES						
U OF SOUTH CAROLINA			127	44	30.4		HOST	91
	5	APPLE MACINTOSH						
	109	IBM PC/XT						
	10	IBM PC/AT						
U OF SOUTHERN CALIFORNIA			278	42	1.0	1980	HOST MICROS	99
	238	IBM PC/XT						
	12	IBM PC/AT						
	26	PC COMPATIBLES						
SO ILLINOIS U, CARBONDALE			45	127	3.4		HOST	13
	35	IBM PC/XT						
	10	ZENITH						
U OF SOUTHERN MISSISSIPPI			69	66	4.0	1983	HOST	29
	11	IBM PC/XT						
	52	TANDY						
	4	LEADING EDGE						
STANFORD U			209	9	1.1	1978	HOST	100
	70	APPLE MACINTOSH						
	7	HP, OTHER MODELS						
	63	IBM PC/XT						
	48	IBM PC/AT						
	21	PC COMPATIBLES						
U OF TEXAS, ARLINGTON			141	60	4.2		HOST	21
	140	IBM PC/XT						

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U OF TEXAS AT AUSTIN			266	41	9.3	1984	HOST	MICROS	94
	20	APPLE MACINTOSH							
	206	IBM PC/XT							
	15	IBM PC/AT							
	25	TI							
TEXAS TECH U			158	49	2.8	1984			0
	10	APPLE MACINTOSH							
	32	DEC RAINBOW							
	10	IBM PC/XT							
	106	ZENITH							
U OF TOLEDO			91	54	3.9	1983	HOST	MICROS	12
	20	IBM PC/XT.							
	71	ITT XTRA							
UTAH ST U			194	1	1.0	1980	HOST	MICROS	21
	14	UNISYS							
	170	TELEVIDEO 1605							
	10	CAMPUS BUILT Z-80							
VALDOSTA ST COL			43	26	13.5	1982	HOST	MICROS	53
	42	IBM PC/XT							
VANDERBILT U (OWEN)			75	12	1.1	1982	HOST		75
	26	APPLE MACINTOSH							
	33	IBM PC/XT							
	11	IBM PC/AT							
	4	AT&T 6300							
VILLANOVA U			55	55	15.0	1983	HOST		47
	38	IBM PC/XT							
	16	ZENITH							
U OF VIRGINIA (MCINTIRE)			88	11	1.7		HOST	MICROS	58
	27	IBM PC/XT							
	61	PC COMPATIBLES							
VIRGINIA COMMONWEALTH U			123	47	2.6	1981	HOST	MICROS	20
	109	IBM PC/XT							
	5	PC COMPATIBLES							
	6	ZENITH							
WAKE FOREST U (BUS AND ACCT)			33	21	1.6	1985	HOST		61
	20	IBM PC/XT							
	13	ZENITH							
WAKE FOREST U (BABCOCK)			77	8	1.0	1983	HOST	MICROS	19
	60	ZENITH							
	14	WANG							
U OF WASHINGTON, SEATTLE			172	21	2.7	1984	HOST		48

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INSTITUTION	#	MICROCOMPUTERS (N>3)	TOTAL MICROS	STUDS/ MICRO	FAC/ MICRO	MICRO YEAR	LINKAGE WITH COMMUNICATIONS		%
	11	APPLE MACINTOSH							
	6	HP VECTRA							
	46	HP, OTHER MODELS							
	82	IBM PC/XT							
	21	IBM PC/AT							
	4	ZENITH							
WASHINGTON U			76	32	1.2	1984		MICROS	100
	30	IBM PC/XT							
	40	IBM PC/AT							
	6	PC COMPATIBLES							
WASHINGTON ST U			163	21	1.3	1982	HOST		34
	6	APPLE MACINTOSH							
	152	IBM PC/XT							
WEST GEORGIA COL			32	92	4.8		HOST	MICROS	56
	28	IBM PC/XT							
	4	IBM PC/AT							
WESTERN CAROLINA U			53	23	22.0	1984	HOST		4
	4	IBM PC/AT							
	20	ZENITH							
	29	EPSON EQUITY III+							
WESTERN ILLINOIS U			133	64	1.5	1977			0
	11	APPLE II SERIES							
	59	IBM PC/XT							
	57	ZENITH							
	5	KAYPRO							
WESTERN KENTUCKY U			92	38	3.2	1983	HOST		10
	17	IBM PC/XT							
	36	ZENITH							
	38	XEROX							
WESTERN MICHIGAN U			93	47	0.0	1983			0
	20	APPLE MACINTOSH							
	43	APPLE II SERIES							
	30	ZENITH							
U OF WISCONSIN, LACROSSE			34	94	27.0		HOST		9
	34	IBM PC/XT							
U OF WISCONSIN, MADISON			143	31	1.2	1984	HOST	MICROS	15
	100	IBM PC/XT							
	10	IBM PC/AT							
	33	PC COMPATIBLES							
YALE U			132	8	1.4	1983	HOST	MICROS	83
	87	IBM PC/XT							
	45	IBM PC/AT							

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INSTITUTION	#	MICROCOMPUTERS (N>3)	TOTAL MICROS	STUDS/ MICRO	FAC/ MICRO	MICRO YEAR	LINKAGE WITH COMMUNICATIONS		& %
U OF ALBERTA	72	APPLE MACINTOSH	157	24	1.3	1981	HOST	MICROS	26
	67	IBM PC/XT							
	6	IBM PC/AT							
	12	ZENITH							
U OF BRITISH COLUMBIA	34	IBM PC/XT	104	54	1.8	1983	HOST	MICROS	69
	58	UNISYS							
	6	ZENITH							
	6	NONAME							
DALHOUSIE U	4	APPLE II SERIES	106	23	0.9	1984	HOST	MICROS	95.
	75	IBM PC/XT							
	25	PC COMPATIBLES							
MCGILL U	45	IBM PC/XT	78	20	0.0	1982	HOST		12
	25	PC COMPATIBLES							
	8	WANG							
MCMASTER U	50	IBM PC/XT	97	36	1.7	1984	HOST	MICROS	69
	8	PC COMPATIBLES							
	36	ZENITH							
QUEEN'S U, KINGSTON, ONTARIO	38	IBM PC/XT	65	39	3.1	1983	HOST	MICROS	68
	18	ZENITH							
U OF TORONTO	4	IBM PC/XT	26	118	49.0		HOST	MICROS	96
	21	ZENITH							
U OF WESTERN ONTARIO	20	HP, OTHER MODELS	134	21	1.6	1983		MICROS	83
	110	IBM PC/AT							